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THE MISSISSAUGA EVACUATION

FINAL REPORT

TO THE ONTARIO MINISTRY  
OF THE  
SOLICITOR GENERAL

November 1981

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The Mississauga evacuation : final  
report to the Ontario Ministry of the  
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THE MISSISSAUGA EVACUATION  
FINAL REPORT

TO THE ONTARIO MINISTRY  
OF THE  
SOLICITOR GENERAL

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The Institute for Environmental Studies  
University of Toronto  
June 1981



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Institute for Environmental Studies  
*Institut pour l'Etude de l'Environnement*

November 10, 1981.

The Honourable Roy McMurtry,  
Solicitor General for Ontario,  
Chairman,  
Cabinet Committee on Emergency Planning,  
Queen's Park,  
Toronto, Ontario.

Dear Mr. Minister:

On behalf of the Mississauga Study Team and of The  
Institute for Environmental Studies, I am pleased to submit  
The Mississauga Evacuation Final Report.

During the course of our study, we have enjoyed the  
help of many people from all levels of government, from the  
private sector, from voluntary organisations, and not least from  
the citizens of Mississauga. We gratefully acknowledge this help.  
Any errors of fact or judgement which appear in our report are  
not theirs, but ours.

We hope that all these groups will find our report  
interesting and useful in their efforts to deal effectively with  
emergencies.

Yours sincerely,

Ian Burton,  
Director.

IB/lh

Encl.



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# **PREFACE**



## PREFACE

When the train derailment of 10 November, 1979, caused the evacuation of the entire City of Mississauga, the Emergency and Risk Research Group at the Institute for Environmental Studies (IES), University of Toronto, was presented with a field laboratory on its own doorstep.

The Research Group is one of several interdisciplinary groups at the Institute for Environmental Studies, which bring together the skills and expertise of specialists from all parts of the University, as well as from government and the private sector. In IES, people are combined into research teams according to the nature of the problem to be studied, and for only as long as the research area warrants.

The Emergency and Risk Research Group had been studying emergency planning and response in Canada for some years, with the support of Emergency Planning Canada. One of its previous case studies of Canadian emergencies had been an earlier evacuation in Mississauga, which resulted from a Texaco oil fire in October, 1978 (Emergency and Risk Research 4: Hazen, 1979). We had also been studying emergency organisational structures and had just completed an analysis of emergency planning in Ontario (Emergency and Risk Research 3: Haussmann and Timmerman, 1979).

As a Research Group, we were therefore well prepared to respond to the Mississauga emergency. While the evacuation was in progress, our researchers made first-hand observations at the Command Post and the International Evacuation Centre. Within one week of their return home, 1,000 evacuated households received a specially designed questionnaire on their perceptions of the emergency and their part in it (Appendix 2). The resulting report attracted wide interest (Emergency and Risk Research 7: Whyte, Liverman and Wilson, 1980).

We realised that the emergency deserved a more comprehensive study, if for no other reason, than the wide international interest



in learning how 226,000 people were successfully evacuated within 24 hours. A proposal was drawn up to carry out a study of the organisational response to the emergency and the social and economic impacts of the evacuation.

The proposal, and the work presented in this report, received major support from the Ontario Ministry of the Solicitor-General. The Minister, the Honourable Roy McMurtry, played a leading role in the government response to the emergency. He also had the insight and political wisdom to see that an in-depth, non-governmental study of the events of November 10-16, 1979, would be of value to emergency planning in Canada and around the world.

Emergency planning agencies in a number of western industrial nations sent observers to the site and attended a major international conference organised by the Ontario Government in November, 1980, on Emergency Planning for the 1980's. The Emergency and Risk Research Group has continued this scientific exchange of information with similar researchers in other countries.

The Mississauga emergency has already been a major learning experience - for emergency planners, emergency response agencies, and for the people of Mississauga. It is hoped this report will add to their understanding by documenting what took place during that week in November and what the longer term costs and benefits are. The Mississauga emergency was unique. It is also part of the pattern of emergencies that can be expected in industrial societies like Canada.

## MAJOR RESPONSIBILITIES

*The use of a common set of field techniques and data analyses, combined with frequent project discussions, has enabled everyone in the Research Group to have input into the various components of the study. It is useful, however, in a report which covers several different topics to indicate for the reader, where the major responsibilities lie. They are:*

Chapter 1.	<u>Introduction</u>	Ian Burton and Anne Whyte
Chapter 2.	<u>Event Reconstruction</u>	Peter Timmerman (with contributions from David Powell)
Chapter 3.	<u>Organisational Response: Decisions and Responsibilities</u>	Peter Timmerman
Chapter 4.	<u>Organisational Response: Meeting Community Needs</u>	David Powell
Chapter 5.	<u>Public Response to the Evacuation</u>	Anne Whyte and Joanne Wojick (with contributions from interviews by Carrie Loring and David Powell)
Chapter 6.	<u>Social Impacts</u>	Anne Whyte and Joanne Wojick (with contributions from interviews by Carrie Loring and David Powell)
Chapter 7.	<u>Economic Costs of the Evacuation</u>	Mel Kliman and Peter Victor (with statistical assistance by Joanne Wojick)
Chapter 8.	<u>Coping with Risk</u>	Ian Burton and Larry Schmidt
Chapter 9.	<u>Learning from Experience</u>	Ian Burton, Peter Victor and Anne Whyte
Appendix 1.	Design of surveys	Tim Daciuk and Anne Whyte
7.	Summary of Chi-square Tests	Anne Whyte and Joanne Wojick
8.	Emergency Operations Control Group	Peter Timmerman

## ACKNOWLEDGEMENTS

This study has received the benefit of the support and cooperation of many individuals and organizations. There are three main groups: the financial supporters and advisors; the research team, and the many people who responded to our requests for information.

The major financial support for the study came from the Ontario Ministry of the Solicitor General. Other financial support was provided by Emergency Planning Canada, the Atomic Energy Control Board, and the Ontario Ministry of Transport and Communications.

The Council of the City of Mississauga gave their moral support, but felt unable to contribute to the financial costs on the grounds, as stated by Mayor Hazel McCallion, that,

*"the people of Mississauga have already suffered enough".*

The Mayor provided a letter of support addressed to the people of Mississauga, asking them to help us in the study. This letter was sent to evacuees with one of our questionnaires and significantly contributed to the good response we received from the public.

To all these people and agencies, and to the Ontario Solicitor General, The Honourable Roy McMurtry, we are grateful for their support and the confidence they placed in us.

For the duration of the study we reported to an inter-departmental committee of the Ontario Government. The Committee consisted of:

Mr. David Allen	Director of Communications Ministry of the Attorney General
Mr. Allan Dickie	Director, Media Communications Ministry of the Solicitor General
Dr. Max Fitch	Director, Special Studies and Services Branch, Ministry of Labour

Mr. Harry Connolly	Field Services Officer, Ministry of Municipal Affairs and Housing
Mr. Walter Giles	Assistant Deputy Minister, Environmental Assessment and Planning, Ministry of the Environment
Dr. Robert MacBride	Program Advisor, Emergency Health Services, Ministry of Health

The Committee gave us helpful advice and asked many pertinent questions of the research team. In particular, Mr. David Allen and Mr. Allan Dickie, provided invaluable liaison with government departments and access to information.

No research project of this scale can be achieved without the untiring input of many people. We were fortunate in being able to assemble a group of researchers who have worked together harmoniously and effectively as a team over the past year. They have made the research experience an exciting and happy one.

In addition to the authors of this report, who all played major roles in the assembly, analysis and writing up of the data, the research team included (at various times): Denise Conway, Tim Daciuk, David Kirkby, Blake Leyerle, Dr. Robert Logan, Carrie Loring and Barbara Pioro. We also received advice from Dr. Larry Bourne, Dr. Tony Lea and Siegfried Schulte (all of University of Toronto) on data analysis and from Merv Norton (York University) and Douglas Torgerson (York University) on organisational analysis. Diana Liverman (now of UCLA, Los Angeles) and John Wilson (University of Toronto) assisted in the design and analysis of the first survey (November 1979). In the final stages, Ted Schrecker helped in the editing of the report.

The study team has had its own tasks coordinated and eased by the excellent administrative role played by Linda Head, Secretary and Administrative Assistant to the Research Group. She, in turn, has been ably supported by the IES Administrative Office, and by Mary Bird, Susan Hawkins and Kathy Robinson who have helped in the typing of the final manuscript. Joanne Wojick, who is also an

author of the report, drafted all the figures.

To all these people, the study owes a great debt.

The third group of people who have supported the project is the largest. It includes all the individuals and organisations who have given us information, granted us interviews and responded to our many questions. It is not possible to name every individual, but the list below includes the individuals, organisations and groups that were contacted during the course of the study, and who gave generously of their time to share with us their experiences and insights.

To each one listed, and to others that are not mentioned by name, we would like to record here that the study is only possible because of their cooperation. Our role has been to record and analyse the experience of these people:

Governmental Organizations

Federal Government

Atmospheric Environment Service, Environment Canada  
Atomic Energy Control Board  
Canadian Transport Commission  
Emergency Planning Canada, Denis Amyot  
Royal Canadian Mounted Police - Sergeant G.J. Gilfoy

Ontario Government

Ontario Ministry of Culture and Recreation:

Jackie Van Veen, Citizen Enquiry  
Mrs. Eastham, Newcomer's Service Branch  
Mrs. Allman, Intake Councillor, Welcome House

Ontario Ministry of Health:

Dr. R. MacBride, Program Advisor, Emergency Health Services  
Rick Armstrong, Regional Manager, Ambulance Services Branch

Ontario Ministry of the Environment:

Gregg Van Volkenburgh  
Tom Cross  
Garnett Kay



Ontario Ministry of Labour, Dr. Max Fitch  
Ontario Ministry of Transport and Communications  
Ontario Ministry of the Solicitor-General

Peel Region

Frank Bean, Chairman  
Board of Education, Jim Ellison, Supervisor of Maintenance  
and Caretaking  
Multi-Cultural Council, Eltore Cardarelli, Vice President  
and Rochael Naklena, Executive Secretary  
Family Services, Jack Spence  
Regional Municipality of Peel, Peter Marshall,  
Health Unit,

Dr. Lillian Cherkas, Medical Officer of Health  
Wynn Burrell, Director of Nurses  
Clifford Clark, Environmental Director  
Home Care Program, Jill Hobson, Physiotherapist,  
June Morley, Nurse Coordinator, at Mississauga  
General Hospital

Audrey Gilpin, Administrator  
Val Hendrickson, Nurse Co-ordinator

Police, Barry King, Staff Inspector,  
Chris O'Toole, Inspector  
Karl Barnhart, Superintendent  
Douglas K. Burrows, Chief of Police

Settlement Services, Laura Bravo  
Social Services, Jim Crozier, Commissioner  
Brian Johnson, Administrator

City of Mississauga

Mayor Hazel McCallion  
Fire Department, Gordon Bentley, Chief  
City of Mississauga, Rick Wilson, Carlton Stewart,  
Len Stewart

Animal Control, Len Addison, Animal Control Supervisor  
City Council, Ken Dear, Councillor (then)

Metropolitan Toronto

Ambulance Services

Fire Department

Police Department, Deputy Chief Cook

Social Services, George Coleman, Director

Senior Citizens Apartments

Emergency Planning, Ian Herbertson

Secretary to the Commissioner, Linda Walsh

Transportation Committee, Special Committee on the  
Grange Inquiry, Alderman Ying Hope

Halton Region

Health Unit, Dorothy Craig, Nursing Director

George Shirton, Health Inspector

Social and Family Services, Rennie Vivian, Administrator

Policy, P.C. David Richards, Planning and Research Department

Educational Organizations

Stan Ager, Campus Supervisor, Sheridan College, Brampton

Al Brown, Principal, J.A. Turner Secondary School

H.J.A. Brown, Superintendent of Business Affairs, Peel

Board of Education (at time)

Sister Felicia, Teacher, Holy Name of Mary High School

Norm Gollert, Principal, Streetsville Secondary School

Harley Lischman, Area Superintendent of Plant Operations,

Halton Board of Education

Jack Porter, President, Sheridan College

Mike Sobko, Campus Administrator, Sheridan College, Brampton

Hospitals and Medical Centres

Peggy Hutchison, Associate Director of Nursing, Mississauga  
General Hospital

Anna Bossella, Nursing Co-ordinator Psychiatry, Mississauga  
General Hospital

Linda Gerger, Director, Mississauga Distress Centre

Dr. A. Toth, Erindale Medical Centre

Non-Governmental Organizations

Church Organizations and Religious Groups

-- Bai-Hai Faith, Mississauga .

Rev. Milton Barry, Rector, St. Paul's Anglican Church,  
Lorne Park

David A. Clarke, Director of Pathfinders, Mississauga  
Seventh Day Adventists

Rev. Chris Costerus, Minister, St. Paul's Presbyterian  
Church, Bramalea

Doreen Covins, Head of Ladies Auxillary, St. Anne's Roman  
Catholic Church, Brampton

Rev. Alan Craig, Minister, Harrison United Church, Brampton

Rev. John Creighton, Chairperson (then), Halton Presbytery  
United Church

Rev. Gerry Day, Minister, Emmanuel United Church, Bramalea

Jim Duffy, Member, St. Anne's Roman Catholic Church, Brampton

Rev. Graeme Duncan, Minister, St. Andrew's Presbyterian  
Church, Brampton

Rabbi Larry Englander, Rabbi, Solel Congregation, Erin Mills

Judy Eves, President (then), Women's Association, St. Andrew's  
Presbyterian Church, Streetsville

Barbara Gal, Member, St. Anne's Roman Catholic Church, Brampton

Ralph Gavert, President, Beth-El Congregation, Oakville

Rev. and Mrs. Gerber, Trinity Anglican Church, Streetsville

Rev. Derwin Hill, Minister, White Oaks Presbyterian Church,  
Meadowvale

Father Andy Hutchison, Regional Dean, Mississauga Anglican  
Church of Canada

-- Jewish Information Services, Toronto

Rev. Kingsley King, Minister, Dixie Presbyterian Church

Lawrence Merkley, Leader, Mormon Church, Mississauga

Ralph Merfin, Bishop of Ward, Mormon Church, Mississauga

Brad Miller, Member, Mormon Church, Mississauga

Father McCormac, Vice-Chancellor for Spiritual Affairs,  
(Secretary to)

Roman Catholic Arch Diocese of Toronto

Marion Morris, Secretary, St. Bartholomew's United Church,  
Brampton

Caroline Murray, President, Women's Auxillary, St. John of  
the Cross Roman Catholic Church, Meadowvale

and Member of Women's Auxillary of Streetsville Minor  
Hockey Association

Rev. Tom Murray, Minister, Grace United Church, Brampton

Rev. Brian Nash, Rector, St. Jame's the Apostle Anglican  
Church, Brampton

Irene Parker, Executive Secretary, Hamilton Conference  
Office of United Church

Noel Patterson, Recording Secretary of Session, St. Andrew's  
Presbyterian Church, Streetsville

Priest, St. Patrick's Roman Catholic Church, Mississauga

Rev. Laurie Purdy, Communications Officer (then), Hamilton  
Conference Office of United Church

and Member, Amateur Radio Emergency Service, Mississauga

Rita Reed, Past President, Catholic Women's League, St.

Joseph's Roman Catholic Church, Streetsville

Rev. J.G. Robinson, Minister, Glenbrooke Presbyterian  
Church, Erin Mills

Lesley Rothschild, Vice-President, Solel Congregation,  
Erin Mills

Rev. Sadler, Minister, St. Luke's-on-the-Hill United Church,  
Mississauga

Alayne Scanlon, Director of News Services, United Church  
National Office

Dr. Vic Sheppard, Minister, Streetsville United Church

Mrs. Smidstra, Caretaker, Community Christian Reform Church,  
Mississauga

Mrs. Paul Smith, wife of Pastor, Streetsville Baptist Church

Rev. John Sullivan, St. Paul's United Church, Brampton

Rev. Susan Thompson, Minister, St. Bartholomew's United  
Church, Brampton

Bernie Weitzman, President, Solel Congregation, Erin Mills

Father Will, Priest, St. Mary's Roman Catholic Church,  
Brampton

#### Community and Voluntary Organizations

##### The Red Cross

Ken McBride, Manager of Emergency Services, Ontario Division  
Red Cross

Eileen Dockman, Executive Director, North Peel Branch Red  
Cross

Arn Greene, Chairperson of Emergency Services, Oshawa  
Branch Red Cross

Pam Heenan, (Current) Chairperson of Emergency Services,  
Mississauga Branch Red Cross

Pearl Howell, Co-chairperson of Emergency Services, Oakville  
Red Cross

Tom Huntley, Chairperson of Emergency Services, North York  
Branch Red Cross; and Member, Canadiana Communi-  
cations Team Ltd.

Margaret Leslie, Chairperson of Emergency Services (then),  
Mississauga Branch Red Cross

Helen McGrath, Chairperson of Canadian Red Cross Corps.,  
Toronto Central Red Cross

Diane McLellan, Vice Chairperson of Emergency Services,  
Scarborough Red Cross

Jane Moon, Co-ordinator of Emergency Services, Etobicoke  
Branch Red Cross

Joan Moulton, Volunteer, North Peel Branch Red Cross

Kay Rumney, Executive Director, Burlington Branch Red Cross

Ruth Sharp, Vice-President (then), North Peel Branch Red  
Cross

Pat Watt, Secretary, Burlington Branch Red Cross

Paul Wharram, Assistant Executive Director, Toronto Central  
Red Cross

Bill Wing, Chief Volunteer Co-ordinator, Mississauga Branch  
Red Cross

Sandra Wong, Director of Health and Emergency Services (then),  
Toronto Central Branch Red Cross

Harry Zwerver, President/Co-ordinator of Emergency Services,  
Etobicoke Branch Red Cross

Salvation Army

Capt. Jim Ellis, Director, Erin Mills Temple

Major Ken Holbrooke, Corps Officer, Etobicoke Temple

Capt. Robert Ratcliffe, Director of Mississauga Temple

St. John Ambulance Brigade

Wayne Cotgreave, Metro Staff Officer (then), Metropolitan  
Toronto Corps St. John Ambulance

E. Erber, Corps Superintendent, Toronto Corps St. John  
Ambulance

Warren McKeown, Volunteer, Halton-Peel Corps St. John  
Ambulance

Col. J.M. Sutherland, Provincial Commissioner, Ontario  
Brigade St. John Ambulance

Scouts and Guides

Ian Bradley, Crew Advisor, 1st Cooksville Venturers

Evelyn Chancey, Assist. Area Commissioner of Cubs, Alders  
Area of Greater Toronto Region Boy Scouts

Frank Holt, District Commissioner (then), Mississauga  
District Boy Scouts

John Lamb, Director Search and Rescue, Mississauga District  
Boy Scouts

Tony Noronha, District Commissioner, Brampton District Boy  
Scouts

Mrs. Lillian Poulin, Deputy Commissioner of White Oaks Area,  
Girl Guides of Canada

Ron Rochester, Regional Field Executive, Greater Toronto  
Region Boy Scouts

Mike Sharples, District Commissioner (now), Malton District  
Boy Scouts

Gerry Steff, Chairperson of Group Committee, 1st Port Credit  
Sea Scouts

Bill Stride, Divisional Commissioner, Mississauga District  
Boy Scouts

John O'Drowski, President, Oakville District Boy Scouts

#### Service Clubs

Harry Robinson, President (then), Credit Valley Lions Club

Don Wilson, Past President, Oakville Lions Club

Hugh Vasey, Past President, Erindale Lions Club

Don Duthie, Past President, Central Lions Club

Bert Holland, Brother, Mississauga Masons

Joe Barrett, Manager of Club, Milton Optimists

Fred Ahrens, President, Brampton/Bramalea Optimists

Bill Dyche, President, Mississauga Optimists

Bud Todd, Secretary, Port Credit Rotary Club

Danny Crymble, Director, Streetsville Rotary Club

David Wilcox, Secretary, Streetsville Rotary Club

Jim Lewis, Secretary, Mississauga Rotary Club

Ron Yates, President (then), Bramalea Rotary Club

Al Brown, President, Brampton Rotary Club

Jim Kenefick, President, Brampton-South Rotary Club

Bill Pycock, Deputy Governor of Zone D., Kinsmen



Bob Holmes, Member, Streetsville Kinsmen

Rick Hoar, President, Bramalea Kinsmen

Al Pettit, President (then), Bramalea Kinsmen

Peter Mehanie, President (then), Brampton Kinsmen

Colin Murray, President, Mississauga Kinsmen

-- Mississauga Valley Community Center

Ted Browne, President, Civitan

Jack McChesney, President, Brampton J.C.'s

Ron Hart, Past President, Brampton J.C.'s

Wayne Haviland, Past President (then), Mississauga J.C.'s

Don Clark, President, Peel Shrine

Hab Lowe, President (then), Mississauga Shrine

-- Variety Club, Toronto

Wanda Parrish, Ladies Auxillary, Brampton Legion

Herbert Spence, Bar Stewart, Brampton Legion

Andre Donato, Secretary, Clarkson Kiwanis

Terry Owen, President, Brampton Kiwanis

Harrison Irvine, Secretary, Dixie Kiwanis

James Benn, President, Brampton Council Knights of Columbus

Paul Walters, Member, Oakville Council Knights of Columbus

Barry Kay, Deputy Grand Knight, Oakville Council Knights  
of Columbus

Rick Beaulieu, Brother, Oakville Council Knights of Columbus

Fred Barrett, President (then), Streetsville Lions Club

Paul March, President, Bramalea Lions Club

Les Coles, President (then), Bramalea Lions Club

John Powell, Past President, Malton Airport Lions Club

Mr. Semeniuk, Past President, Cawthra Lions Club

Helmut Loewen, President (then), Dixie Lions Club

Mrs. Bill Auld, Wife of President (then), Clarkson Lions Club

Harry Robinson, President (then), Credit Valley Lions Club

#### Service Societies and Associations

Pat Sibbald, Department Head, Children's Aid Society,  
Mississauga



Yvonne Johnston, Community Service Co-ordinator, Children's  
Aid Society, Mississauga

Pat Meyer, Administrator in Mississauga Association for the  
Mentally Retarded

Jim Garbutt, Director of Residential Services, Oakville  
Association for the Mentally Retarded

Sue Ball, Senior Counsellor, Oaklands Regional Centre

Janet Jones, Acting Superintendent, Syl Apps Training Centre

George Jones, Ontario Hospital Association

Tom Hughes, Director, Ontario Humane Society

Leslie Brody, Staff, Ontario Humane Society, Mississauga

Bonnie O'Neill, District Director (then), Peel Victorian  
Order of Nurses

Pat Booth, Head Nurse, Peel Victorian Order of Nurses

Military Training Organizations

Bob Beck, Commanding Officer, 845 Squadron Royal Canadian  
Air Cadets Corps., Mississauga

Capt. Armand Chateau-Vert, Commanding Officer, 540 Squadron  
Royal Canadian Air Cadets Corps., Oakville

Major Don Lee-Thompson, Commanding Officer, 758 Argus Squadron,  
Royal Canadian Air Cadets Corps., Brampton

Capt. Norman Harris, Commanding Officer, 105 Royal Canadian  
Army Cadets Corps., Streetsville

Rick Burton, Commanding Officer, 2824 Royal Canadian Army  
Cadets Corps., Mississauga

Major Alfred Barnes, Commanding Officer, 1188 Royal Canadian  
Army Cadets Corps., Oakville

Major Jack Dickens, Commanding Officer, 440 Royal Canadian  
Army Cadets Corp., Appleby College, Oakville

Capt. Fred Hawkins, Commanding Officer, 557 Royal Canadian  
Army Cadets Corps., Brampton

Lt. Ian Mann, Commanding Officer, Royal Canadian Sea Cadets  
Corps., Weston

Capt. Gord King, Commanding Officer, Royal Canadian Sea  
Cadets Corps., Haida, Mississauga

Lt. Col. L.H. Smith, Commanding Officer, Lorne Scots,  
Brampton Militia

#### Nursing Homes

Carmel Heights Home for the Aged, Sister Mary Rita,  
Administrator

Chelsey Park I Nursing Home, Mrs. Rowe, Administrator

Erin Mills Lodge Retirement Home, Betty Slocum, Administrator

Mississauga Extendicare Nursing Home, Mrs. Carson, Director  
of Care

Oakville Extendicare Nursing Home, Mrs. Cunliffe, Administrator

Peel Manor Home for the Aged, Jean Duffy, Health Care Aid

The Pines Home for the Aged, Christine Stewart, Administrator

Taara Nursing Home, Mrs. Bajin, Owner

Sheridan Villa Home for the Aged, Roger Maloney, Administrator  
and Linda Instance, Assistant Administrator

Tyndall Nursing Home, Nancy Roger, Director of Nursing

#### Trade Unions

George Hicks, Financial Secretary, 707 Galaxy Club of  
Local 707 U.A.W.

Victor Darling, Human Rights Chairperson, 707 Galaxy Club  
of Local 707 U.A.W.

#### Medical Doctors

Dr. E. Rix, General Practitioner

Dr. H.L. Levy, Respiratory Specialist, Mississauga General  
Hospital

Dr. Peter Strachan, Paediatrician

Dr. Michael Lester, Paediatrician

Dr. Andrew Sarne, Chief of Emergency Physicians (then),  
Mississauga General Hospital

Dr. Tom Lofft, Child Psychiatrist

Dr. Alexander Borgiel, Chief of Family Practice (then),  
Mississauga General Hospital

Private Commercial Organizations

Randy Franklin, General Manager, International Centre  
Maxine Kelly, General Manager, Sheridan Mall Shopping Centre  
Grace Kelleher, President, Kelleher Agency of Century 21  
Real Estate  
Don C. Lord, General Claims Agent, Canadian Pacific Railway  
The Dow Chemical Company -  
Len Weldon, Vice-President  
Stuart Greenwood  
Fred Hamlin  
Ron Johnson  
Bill Johnston, Administrator,  
Erin Mills  
Canadian Pacific Railway Company

Pharmacists

Al Evenson and Henry Ho, Shopper's Drug Mart, Applewood Hills  
Carl Horowitz, Carl's Pharmacy  
Clara Miguel, Shopper's Drug Mart  
Mr. Peckett, Peckett's Pharmacy  
The Pharmacist, Boots Pharmacy, Square One Shopping Plaza

Miscellaneous Individuals and Organizations

Carol Berry, Malton Community Council  
Professor Frank T. Denton, Department of Economics,  
McMaster University  
M-TRAC, Metropolitan Toronto Resident's Action Committee  
for Railway Safety

Archie Gillies, Ontario Welfare Council

John Nestor, Director, CLAIM (a citizen's action group  
organized to obtain compensation from C.P. Rail)

Clifford Lax, Lawyer

Mike Goldstein, Emergency Co-ordinator for Metropolitan  
Toronto of Amateur Radio Emergency Service

Sandra Reynolds, Women's Auxillary, Streetsville Minor  
Hockey Association

In addition to these individuals and organizations all of whom played a role in responding to the needs of the evacuation, a further 2,000 people responded to written mail and telephone questionnaires.

We gratefully acknowledge the patience, good will and helpfulness of all these persons. The errors of fact or judgement are not theirs but ours.

## **Chapter 1**

# **THE STUDY AND ANALYSIS OF EMERGENCIES**



## CHAPTER 1. THE STUDY AND ANALYSIS OF EMERGENCIES

### 1.1. Objectives of the Study

This report is about one event - the derailment of a train just before midnight on Saturday, 10 November, 1979, at the Mavis Road Crossing in Mississauga, Ontario. More precisely, it is about the chain of consequences of that event - the explosions and fires in derailed propane tank cars; the leakage of chlorine from a large hole torn in a chlorine tank car; the evacuation from their homes of nearly a quarter of a million people; and the closing of most of a city for a week (Figure 1.1).

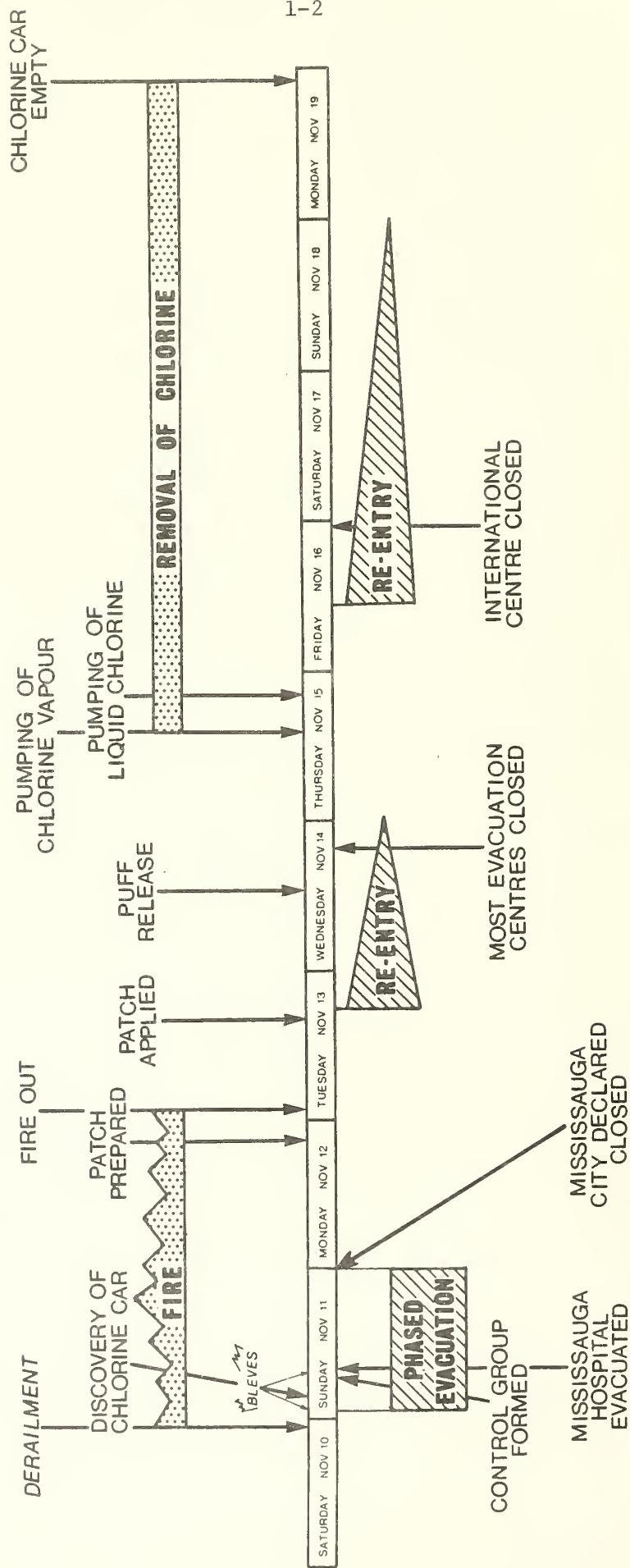
The point of departure for this study is the derailment. It is not our purpose to ask how, or why, the accident happened. Our purpose is to examine its consequences in order to suggest ways in which we, as a society, can be better prepared to prevent, and to respond to future emergencies.

For this purpose, four main objectives were set for the study:

- (a) to record accurately, and in detail, the events following the derailment;
- (b) to analyse the response to the emergency of
  - (i) government,
  - (ii) voluntary agencies,
  - (iii) private sector,
  - (iv) the public;
- (c) to assess the social, health and economic costs of the evacuation;
- (d) to examine aspects of the institutional framework surrounding the emergency, including
  - (i) emergency planning,
  - (ii) risk assessment,
  - (iii) insurance,
  - (iv) compensation.

The study was not asked to make formal recommendations to government on its findings, but to identify what lessons have been and can be learnt; and to make the experience of the evacuation

FIGURE 1.1 THE MISSISSAUGA EMERGENCY





of virtually an entire city available to a wider audience. There are valuable lessons to be learnt from Mississauga and these are drawn together in the last Chapter.

## 1.2. INTRODUCTION TO THE REPORT

### 1.2.1. Event Reconstruction

History is always selective. It is never possible to record everything exactly as it happened. Consider the assassination of President John F. Kennedy in 1963. This took place in full view of thousands of observers. Film cameras recorded the event from several angles. Tape recorders recorded the sounds. The Warren Commission, a Senate investigation and the work of numerous independent investigators have so far failed to dispel uncertainty about what took place. This is not a peculiarity of this one event. It is characteristic of all past events. The innate complexity and unfathomable character of the past is only made evident when it becomes vitally important to know what happened. In this report, the main reconstruction of the events that followed the Mississauga derailment focusses on the activities of the Control Group, and on those who were advising on, and implementing the Control Group's decisions (Chapter 2). Elsewhere in the report, other perspectives are given, including the experiences of the evacuees themselves. Some of these are presented as 'vignettes' of peoples' experiences presented, as far as possible, in their own words (to be found on the green pages throughout the report). They provide their own synthesis of the events that took place.

### 1.2.2. Response to the emergency

The management of the emergency and the large-scale evacuation required the input of many agencies and individuals. Through the evacuation, many members of the public also became directly involved. Analysis of organisational behaviour in terms

of sector (such as governmental, non-governmental, business); or levels of government (municipal, provincial, federal); or of jurisdiction (Health, Environment, Labour, etc.) is less useful for the study of emergency response than is an analysis of inter-agency behaviour. In emergencies, the response is defined by the interaction of sectors, levels of government and ministries.

In the Mississauga emergency, three critical nodes of interaction developed:

- (a) within the central decision-making body, known as the Control Group, and the larger advisory "think tank";
- (b) within the social service agencies, many of whom are voluntary organisations, which looked after the community and health needs of the evacuees;
- (c) between the evacuees themselves, and their families, relatives, and friends.

These three areas of response are discussed in Chapter 3 (the Control Group decisions); Chapter 4 (Meeting Community Needs) and Chapter 5 (Public Response to the Evacuation).

### 1.2.3. Impact Assessment

The Mississauga emergency is unusual in its distribution of costs between direct and indirect damage. The amount of physical property damage was relatively slight (except to the train and track). There were no deaths and only a few minor injuries. The major costs resulted from the dislocation of 226,000 people from their homes and the complete cessation of all businesses and normal public sector activities in the city for several days.

The emergency, therefore, represents something of a challenge to researchers to first, define what can reasonably be included as a cost, and second, to try to measure it. Intangible costs, such as anxiety and loss of amenities, are always the most contentious, and most difficult impacts to measure in any assessment. In the Mississauga emergency, intangible costs and a large number of relatively small economic losses, spread over 75,500 households, form a major part of the impacts to be assessed.

The social and health impacts of the emergency are presented in Chapter 6 and the economic costs of the evacuation in Chapter 7.

#### 1.2.4. Institutional framework of the Emergency

The report discusses four aspects of the institutional framework of the emergency but does not deal with them in detail. They are included because they raise issues about emergency planning and response in Canada, and about the Canadian approach to low probability-high magnitude risks, which the Mississauga accident exemplifies.

Chapter 8 discusses risk analysis for major transportation accidents, especially those involving chlorine, and compares the results of such analyses to the Mississauga emergency. It also discusses the ways in which companies can insure themselves against large-scale losses. Without admitting liability, CP Rail provided immediate compensation for out-of-pocket expenses to evacuated households; Chapter 8 presents the public response to this gesture.

One of the fortunate aspects of the Mississauga derailment is that it happened in a municipality that had experience of previous major emergencies, and which had developed expertise in emergency planning and response. This important context to the management of the emergency is presented at the beginning of Chapter 3.

### 1.3. THE STUDY OF EMERGENCIES

Emergencies, particularly where they result in loss of life and injury or large-scale property damage, have received considerable study. The assessment of damages has been a major area for investigation. Studies of emergency management have tended to focus on pre-emergency planning; or the behaviour of communities and individuals to warnings and during the crisis; or on later reconstruction activities and long-term trends in social adjustment to hazards.

These phases in emergencies can be shown diagrammatically (Figure 1.2). Thus, emergency planning, crisis management, and rehabilitation and reconstruction, are all parts of a positive feedback system through which organisations and individuals learn how to cope with risks. Compared with the emergency system shown in Figure 1.2, the derailment at Mississauga was:

- (a) a single event; which
- (b) happened without warning;
- (c) required little reconstruction of buildings and services; and
- (c) through this, and other reports, will influence pre-event planning.

This report, therefore, concentrates on the system components that are shaded in Figure 1.2.

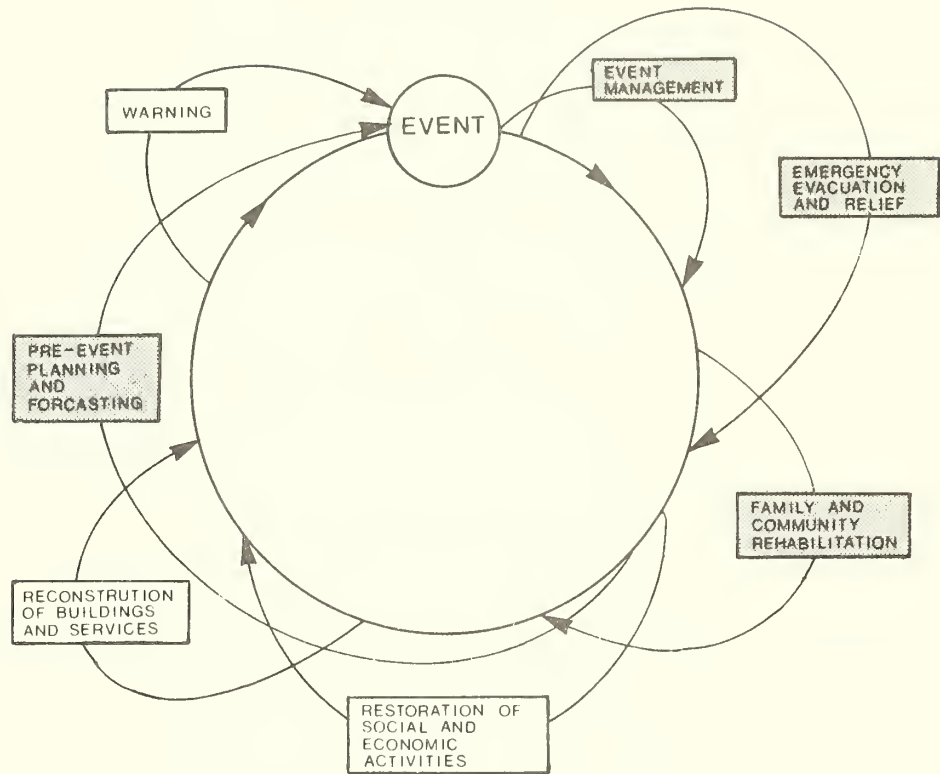
#### 1.4. METHODS

The analysis of the Mississauga emergency is based on three main data sources:

- (a) six public questionnaire surveys conducted by the study team;
- (b) interviews with selected decision-makers, agency officials, and householders;
- (c) reports on the emergency and transcripts of meetings.

Whenever possible, cross-referencing of data sources was carried out, and the surveys were designed to meet the needs of several study components at the same time. Chapters 2 - 4 are primarily dependent on interviews and reports, including transcripts of meetings, while Chapters 5 - 7 draw heavily on the statistical survey results, supported by more in-depth interviewing. Chapter 8 is based mainly on personal interviews with survey data about the public response to compensation.

FIGURE 1.2

EMERGENCY MANAGEMENT  
SYSTEM

#### 1.4.1. Questionnaire surveys

The results of six, specially designed surveys are presented in this report. These are:

- (a) a mailed questionnaire survey of 991 households in the evacuation zone conducted within two weeks of the accident (first reported in Whyte, Liverman and Wilson, 1980);
- (b) a mailed questionnaire survey of a further 999 households, conducted 9 months after the derailment (July 1980);
- (c) a mailed questionnaire survey of 500 people who were registered in Evacuation Centres (July 1980);
- (d) a telephoned questionnaire survey of 500 households located just outside the northern perimeter of the evacuation zone (July-August, 1980);
- (e) a telephoned questionnaire survey of 500 households designated as a control group and matched for socio-economic characteristics and distance from a main railway line (August-September, 1980);
- (f) a mailed questionnaire survey of 606 businesses located within the evacuation zone.

These surveys were designed to represent systematic random samples of evacuated households, people using Evacuation Centres, households on the northern perimeter and a control group. For the two main samples of evacuees, conducted 2 weeks and 9 months after the derailment, the surveys investigated the public's:

- (a) immediate response to the emergency;
- (b) evacuation behaviour (including selection of temporary shelters and travel between destinations);
- (c) short and longer term costs and benefits (both economic and social);
- (d) response to information, and communication channels;
- (e) perception of risks;
- (f) claims and attitudes towards compensation.

In addition, the survey of evacuees registered at Centres probed their experiences at, and their evaluations of, the



Evacuation Centres. The control group was used to test:

- (a) the change in risk perceptions of the evacuees;
- (b) the difference in attitudes to compensation before and after suffering a loss;
- (c) communications between households inside and outside the evacuation zone.

The sample of businesses was used to study how, and to what degree, the evacuation caused losses to different kinds of enterprises.

The design of the samples, sampling procedure, and the response rates are discussed in Appendix 1; and the questionnaires are shown in Appendices 2 to 6. A description of the Chi-square test and the results of selected statistical tests are given in Appendix 7.

#### 1.4.2. Interviews

Unlike the surveys, which were designed as systematic random samples of the study populations, the interviews were conducted with purposively selected people. Many of these people were individuals with key roles and special knowledge of the emergency. These, and the organisations they represent, are listed in the Acknowledgements.

Other people, particularly members of the public, were selected because they represented a relevant sub-section of a larger population. For example, from among those households who responded to the questionnaire survey, people were chosen for an interview who represented one or more of the following groups:

- (a) Evacuation Centre users;
- (b) people living near the accident site;
- (c) people living on the northern perimeter of the evacuation zone;
- (d) the elderly, handicapped and others who have special difficulty in moving;
- (e) families with young children or pregnant mothers;
- (f) people who did not evacuate;
- (g) people who tried to enter the evacuation zone.



These interviews were semi-structured; that is, they covered a specific set of topics, but not necessarily in a set order. The person being interviewed was encouraged to provide any other information and detail that he or she considered relevant. The interviews were conducted in peoples' homes or offices and were deliberately conversational in tone. For some interviews, several members of a household were present. Some interviews were tape-recorded; others were recorded in note-form by the interviewer.

In addition, semi-structured (and usually shorter) interviews were conducted by phone. These were done for one or more of several purposes:

- (a) to check up on specific points of information;
- (b) to obtain the names of other contacts for interview;
- (c) to arrange for a fuller, personal interview later;
- (d) to verify information from one detailed interview by enlarging the number of observations.

#### 1.4.3. Reports and Transcripts

The study has also drawn upon several reports on the emergency, both published and unpublished, as well as transcripts of meetings. The official inquiry into the derailment was conducted for the Government of Canada by the Honourable Mr. Justice Samuel G.M. Grange of the Supreme Court of Ontario (Canadian Transport Commission, 1980). The Inquiry lasted for 127 days and produced 23,594 pages of transcript. The report (known as the Grange Report) is itself 212 pages in length.

Transcripts of the Control Group meetings and the Peel Regional Police transcripts and log of the emergency response were among those made available to the study team. In-house reports of ministries, voluntary agencies, and the Mississauga Hospital also provided important information.

Other reports on the Mississauga emergency include a United States consultant report (NUS, 1980), and one written for the Canadian Police College (Scanlon, 1980). The Ontario government prepared a report called 'Derailment - the Mississauga Miracle' (Havey, Dickie and Allen, 1980). A more popular book is 'Hot Box' (Cahill, 1980).

Extensive use of written reports and transcripts was made in Chapters 2 and 3 of this report. Where accounts of events differed, the study team tried to identify the correct version, through interviews with those involved and through close examination of transcripts. The results are contained in the Event Reconstruction that follows.



## **Chapter 2**

# **EVENT RECONSTRUCTION**



## 2.1 THE SETTING AND BACKGROUND

### 2.1.1. Background

The City of Mississauga, in the Regional Municipality of Peel, is one of the great Canadian success stories of the post-war period. The entire Region went from a 1941 population of 31,000 to a 1971 population of 260,000. In November 1979, there were more than that number of people living in Mississauga alone. This spectacular growth is dependent, as much as anything, on transportation. The rivers, roads, and railways criss-crossing the area west of Toronto were substantially responsible for the establishment and maintenance of the small towns and villages before the war; while the power of the automobile fueled the great suburbanisation of the area in the post-war years. In the words of a city brochure, Mississauga is "a city with the best connections and room to grow".

The best connections include the Toronto International Airport to the north at Malton; Highway 401 and the Queen Elizabeth Way; and three mainline tracks operated by Canadian National and Canadian Pacific Railways. Each of these transportation facilities has claims to being the busiest transportation corridor of its kind in Canada.

The possibilities for hazardous events whether connected or unconnected with transportation, have grown with the city. There have been previous emergencies: a natural gas explosion in 1969; an air crash near Malton in 1970; a hostage-taking incident in 1975; and another air crash and an oil refinery fire in 1978. The most recent was the train derailment just before midnight, November 10, 1979, at the Mavis Road crossing in the Centre of Mississauga.

What this event reconstruction tries to provide is not only an account of how this particular hazardous event affected the City of Mississauga and Peel Region on an unmatched scale; but also an account of the great resources - human and physical - that can be

marshalled to match the scale of the hazard.

#### 2.1.2. The Train and its Cargo

At the time of its derailment on November 10, 1979, CP Rail Train 54 was nearing the end of a run from Windsor to the Toronto marshalling yards at Agincourt. It was made up of 3 engines and 106 cars. En route, it had undergone a number of changes - it began as Train 84 out of Windsor - and a series of additions and subtractions of cargo.

The run began in Windsor at 12:45, Saturday afternoon, with 57 cars, none of which contained dangerous commodities. At 15:00, the train pulled into Chatham to await the arrival of Local 4, a train from Sarnia composed of 69 cars, 63 of which were consigned to CP Rail at Chatham. Thirty-eight of these contained "dangerous commodities": 28 carried liquid petroleum products, 5 petroleum derivatives, 4 caustic soda, and one carried 90 tons of chlorine (car number CGTX 9009); 13 others carried materials CP Rail does not regulate as dangerous commodities, including styrene, petroleum oil, and auto parts.

At 18:00, the train left Chatham with 102 cars. Through the rest of the evening, empty cars and loaded cars were dropped and added at London (where the train became Train 54) and Woodstock. At 23:25, the train arrived at Guelph Junction, near Guelph. There were now 106 cars: 84 loaded, 22 empty. Concentrated almost half-way down the train was a mixed assortment of 24 cars containing styrene, toluene, propane, and caustic soda. Among them was the car of chlorine (No. 64 - counting from the back of the train).

#### 2.1.3. Tests and Inspections

According to testimony before the Mississauga Railway Accident Inquiry (the Grange Commission), the train was tested and inspected a number of times before the derailment. Tests and inspections included:



- a) mechanical inspection in marshalling yards, including full brake inspection;
- b) mechanical inspection in interchange from one railway to another, including partial brake inspection;
- c) pull-by visual inspection by carmen as trains passed through terminals;
- d) visual inspection by passing trains;
- e) running visual inspection by crew of the train.

The last major inspection, which involved checking cars with plain bearings and partial brake testing, was done at Chatham, between 16:00 and 18:00, Saturday. All subsequent inspections were visual. Three trains were met, and mutual inspections were made in passing, the last being at Guelph Junction. Nothing unusual was seen.

The crew on Train 54 was a 3-man crew, differing from the standard 4-man crew in that there was no tail end trainman. In 1979, reduction of crews on trains of less than 120 cars was allowed, the trail end trainman being eliminated. The crew consisted of Keith Pruss, engineer, and Larry Krupa, head end trainman (also Pruss' son-in-law) at the front, and William ("Ted") Nichol, the conductor, at the back. They came on duty at London. None of these three saw anything suspicious until the derailment.

The car which would eventually cause the derailment was a car of toluene, 649 metres from the head end and 1,339 metres from the tail (it was 33 cars from the front). Between Guelph Junction and Mavis Road, the best place for a visible inspection of most of the length of the train is at a long curve beginning at Winston Churchill Blvd., which straightens up just before Mavis Road (Figure 2.1). Both the conductor and the head end trainman have testified that they inspected the train at the start of this curve. The engineer was preoccupied with many crossing signals and switches as the track approached the built-up area around Toronto.

#### 2.1.4. Cause of the Derailment

The derailment was caused by the overheating of a journal box in the 33rd car. A "journal" is the extreme end of one of

the axles, which support the railway car and are attached to the wheels. Each car has journal boxes which house the journals and regulate the friction between the moving axle and the mountings securing the axle to the car above through the use of bearings. Newer cars use roller bearings, but the 33rd car used plain bearings. A lubrication pad between the bearings and the journal is soaked in oil and must be topped up fairly frequently. If the lubrication pad fails or dries out, the friction of bearing against journal will cause overheating and eventual burnout of the axle. This is a "hot-box" incident.

In this case, the right-rear journal box of Car 33 began to overheat. The car, originally made by Hawker-Siddeley in 1967, was owned by North American Car Corporation and leased to Shell Canada in 1970 as a general purpose tank car. In July, 1979, it was repacked with journal lubricator pads at Chesapeake and Ohio's yard in Sarnia. From debris picked up after the derailment, it appears that 6 x 12 inch lubricator pads instead of 6 x 11 inch lubricator pads were installed in some of the journal boxes by mistake (the actual pad went up in smoke). There is a chance that this may have been one of the causes of the overheating. It is CP Rail's contention that this is indeed the case. The man who conducted journal box inspections at Chatham testified at the Grange Commission hearings that he would have added oil if the level had fallen below three-quarters of an inch in the box (one-half inch is acceptable). Mr. Justice Grange cast doubt on the records of this inspection, but not necessarily on the inspection itself.

One area of dispute is the type of "hot box" fire that was created. The fact that the crew of the train did not detect any fire until the derailment suggested to CP Rail that there was a quick burn-off; that is, that the fire began sometime after Winston Churchill Blvd., becoming intermittently bright only at Derry Road, and thus out of the best view of the crew. On the other hand, if the fire had been a typical burn-off, the fire would have

started 29 to 32 km. before derailment and would have caused a trail of smoke and a constant fire to be present by the time the train passed Winston Churchill Blvd. A test run, with a constant light affixed, showed that a small fire could be seen along the Winston Churchill Blvd. curve for approximately 50 seconds.

#### 2.1.5. Witnesses Before the Derailment

At this point, the testimony of witnesses to the passage of the train becomes relevant (see Figure 2.1 for locations mentioned).

A Mr. and Mrs. Houston testified at the Grange Commission hearings that they saw smoke coming from the right rear of the train as it went through Campbellville, 35 kilometres from the derailment site (23:15). A Mr. Anthony, 17 kilometres from the derailment at Trafalgar Road, saw nothing unusual. (He was on the north side of the train, however; the right rear journal box was on the south side). A Mr. and Mrs. MacGregor saw a fire, four feet in diameter, under the wheels at the Derry Road crossing. Two other witnesses between Derry Road and Eglinton Avenue testified that they saw nothing unusual. Mr. Justice Grange's assessment of this is as follows:

*"I think it is a reasonable if not an inescapable inference that there was some flame, perhaps not steady, to be seen at Winston Churchill Blvd. by those who could see and were looking....I conclude that there was fire or sparks or both emanating.... from Derry Road to the derailment."*

And, of the last inspection, he notes:

*"On the fifth, the running inspection from Guelph Junction, the 'last defence', as it has been called, I can only say that either the crew or the system fell down badly. By that I mean either the crew or the system or both were not up to discovering the hot-box in time to prevent the derailment."*

It is the resolution of these matters which is before the courts at present.

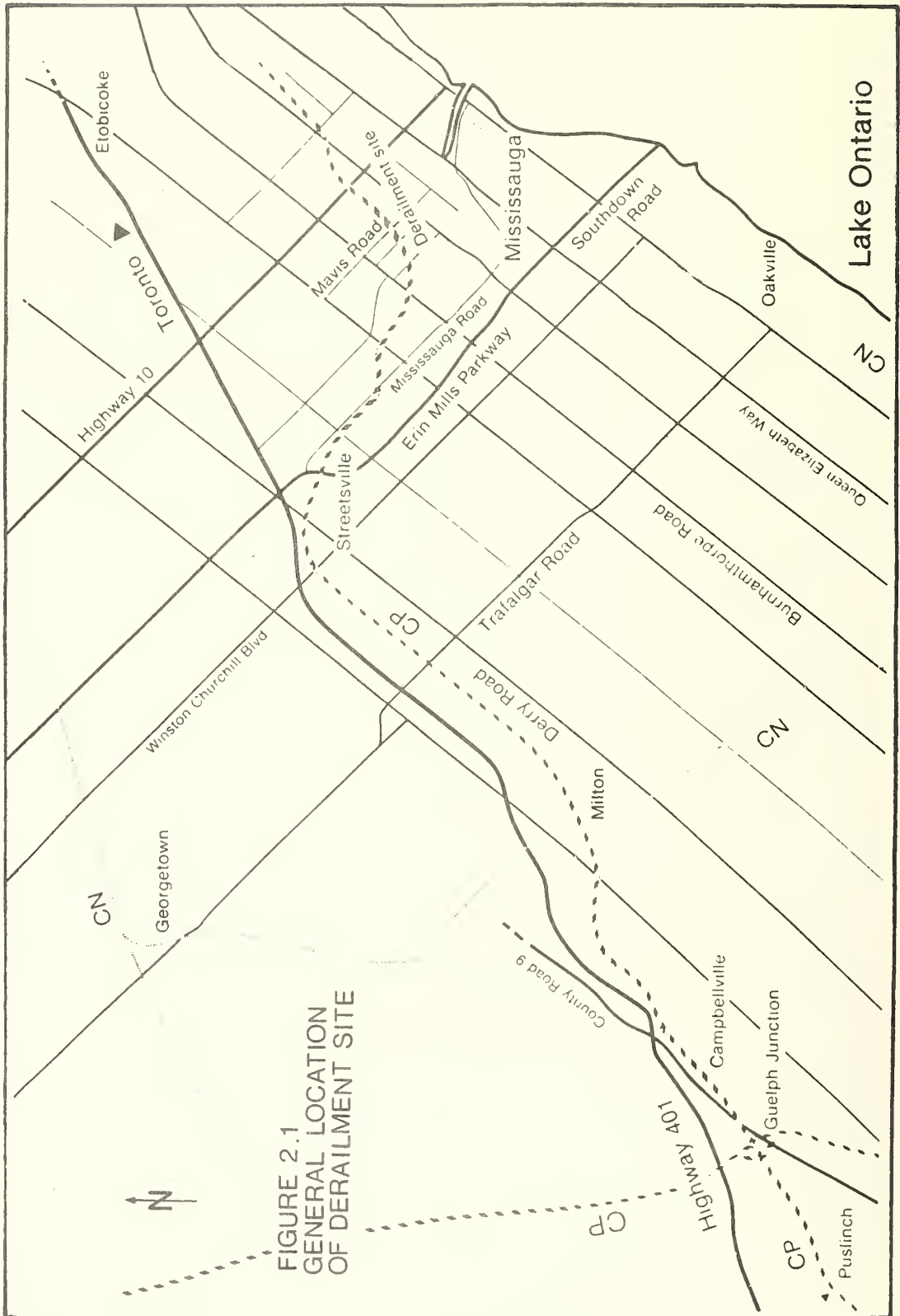


FIGURE 2.1  
GENERAL LOCATION  
OF DERAILMENT SITE

## 2.2 SUNDAY

### 2.2.1. The Derailment

Between Winston Churchill Blvd. and the derailment site, the train was travelling at approximately 80 kilometres per hour, a speed which has subsequently been criticised, but which was acceptable according to regulations at the time. It therefore took the train approximately 10 minutes to cover the 13.4 kilometres between Winston Churchill Blvd. and Mavis Road. From the evidence, it seems that the journal box burnt through between McConnell Road and Burnhamthorpe, causing the rear axle assembly at the right rear of the car to drop. This was approximately 3 kilometres from Mavis Road. The right rear wheel began shifting to the south, until ultimately the entire axle went flying into a backyard on Freeport Avenue, alongside the tracks, just south of Burnhamthorpe Road. The car proceeded with the rear of the car trailing along the tracks, supported by the front two sets of wheels and the one remaining lead set of rear wheels. Crossings and switches were damaged all along the remaining route. The car made it over the switches at Erindale Station Road, although both front axles were damaged in passing, and the axles probably shifted south, coming away from the car. Witnesses at Erindale Station Road reported fan-like flames flying up the side of the tank car.

In his house on Eaglemount Crescent, the last street of houses before Mavis Road (see Figure 2.2), Peel Regional Police Constable Chuck McConnell heard the train approaching:

*"It was the normal time, the normal train,  
but something didn't sound right."*

He walked up to the window overlooking the tracks. The train screeched and banged as it went by. Other witnesses at Wolfedale Road crossing reported the tank car giving off a spray of sparks, and listing over to one side.

For about 3 kilometres, the damaged train had been passing through residential neighbourhoods. Having managed to

stay on the tracks past Wolfedale Road, it came into an industrial area again (see Figure 2.2). On either side of the next crossing, the Mavis Road crossing, are small factories and factory outlets, a Mississauga Hydro building, and Mississauga Parks and Works Department facilities. Beyond the crossing is the last significant space of open waste ground between Mississauga and Union Station in Toronto. About 1.5 kilometres further east, residential housing begins again. It was at this Mavis Road crossing, luckily enough, that the dangling undercarriage hit a switch to the Akaril Chemical Ltd. building and finally derailed.

At 23:54, the three engines and the first cars went through the crossing, accompanied by "the screeching of metal". Mr. and Mrs. Ronald Dabor had stopped their Lincoln Continental on the north side of the crossing to let the train go through. Mrs. Dabor remembers trying to count the cars as they went past. Then she realised that there was a wheel off the track, giving out sparks. They suddenly saw cars begin to uncouple and pile into each other. This was at 23:54:27.

A transcript of radio communications between the engineer, the conductor and the Dispatch Co-ordinator at the Toronto Yard shows the following:

23:54:00 *"CP 54 to CP Terminal Dispatcher"*  
*(Engineer to Dispatcher)*

23:54:27 *"We're in the big hole Ted, but*  
*still moving." (Engineer to*  
*conductor - "big hole" means emergency)*

The engineer heard the rush of air pressure escaping from the brake lines, as the train uncoupled and the depressurising of the air brake lines automatically applied the brakes. Krupa, the head end trainman, looked out the window and yelled,

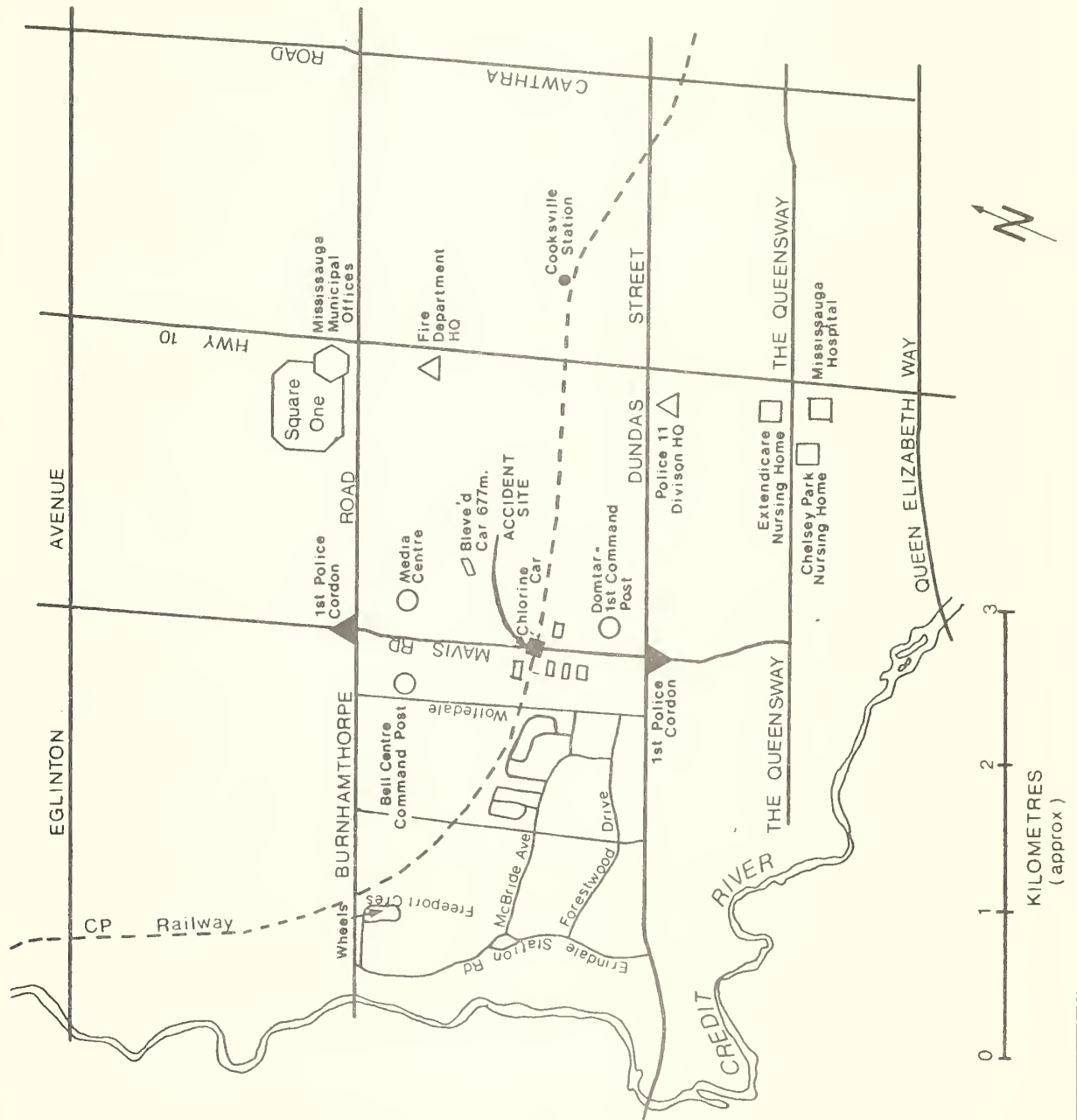
*"Oh, my God, we've got a tanker afire."*

The transcript continues:

23:54:47 *"Jesus Christ Ted, one of them*  
*tank cars blew up." Tail end of*  
*54 (engineer to conductor).*



FIGURE 2.2 THE NEAR SITE



At the crossing, Mr. Dabor had put his car into reverse, as bits of metal began flying through the air. He lost control of the car, and it swerved back into the ditch. The Dabors abandoned the car, and began running north. They were knocked to the ground by the first big explosion. They got to their feet again and finally reached Burnhamthorpe Road where they saw a policeman.

Counting from Car 32 back (33 becomes derailed Car 1), 24 cars were derailed (Figure 2.3). Derailed car number 8 appears to have been the first propane car to experience a Boiling Liquid Expanding Vapour Explosion (BLEVE), which flung it 43.5 metres east. Other propane and toluene cars were punctured and ignited.

Due to the momentum of the train, cars beginning with 33 were dropped 75 metres beyond the street crossing; and the now disengaged front 32 cars and the engines rolled 1.9 kilometres east of Mavis Road before the air brakes stopped them. Krupa volunteered to run back from the engine to the 32nd car and close the angle cock, a valve which would allow air pressure to build up in the train once more, and thereby allow the release of the brakes<sup>1</sup>. Krupa ran back down along the train, keeping in radio contact with his engineer. The CP Rail dispatcher, also in contact, advised Pruss to get the train out of the area as soon as possible. Krupa reached the 32nd car, closed the angle-cock, and the train moved on a slight distance. There was a second, more massive BLEVE at 12:09, which Krupa reported seeing, in which a tank car (probably Car 13) was hurled like a rocket, in his general direction, ultimately coming to rest 675 metres to the northeast. He yelled into his radio for the engineer to pull the train further along the track. The train moved on to Cooksville, 3 kilometres east.

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<sup>1</sup> Note that air brakes, unlike the hydraulic brakes with which we are more familiar, are applied by the release of pressure from brake lines; hence, a broken line or connection such as would accompany the decoupling of cars would automatically apply the brakes. The train could not restart until pressure could be build up again in the braking system.



### 2.2.2. Configuration of Cars

Behind them lay a jumble of cars, 24 in all (see Figure 2.3). At the heart of the jumble, possibly punctured by the BLEVE of Car 8, was Car 7, filled with 90 tons of chlorine. Ahead of it on the tracks were four cars of caustic soda (Cars 3-6); behind it were pieces of the BLEVE'd car of propane (Car 8), three twisted cars of styrene (Cars 9, 10, and 11), and a long string of propane cars (12, 13, 14, 17-23). All the propane cars were either ruptured or damaged, with their contents flowing off or exploding. The box cars burned. The styrene cars and caustic soda cars poured their contents onto the tracks, through punctures or damaged outlet valves, as did two of the toluene cars. The last car in the derailment, a toluene car, was found still to contain its cargo when the cleanup finally began some days later.

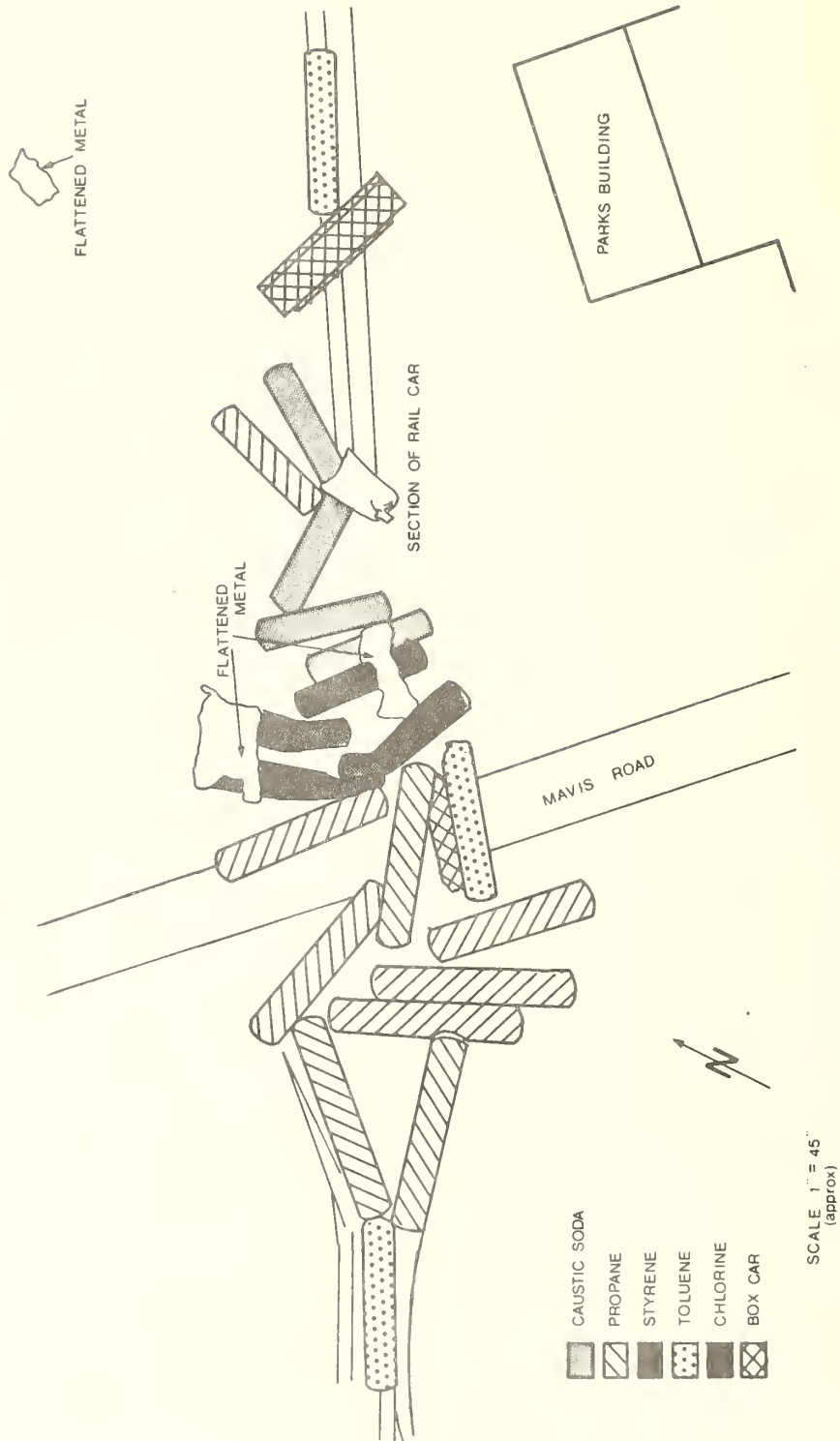
### 2.2.3. Initial Response: Police, Fire, Ambulance

The first agencies to respond to the derailment were the Peel Regional Police, Mississauga Fire Department, and Halton-Mississauga and Metropolitan Toronto ambulance services. All of these organisations had had experience in emergencies and in planning together for emergencies. Toronto International Airport at Malton to the north had been the scene of a number of major incidents in recent years. Only a year previously, the oil refinery fire at a Texaco plant in Clarkson, in the southern part of the area, had resulted in the evacuation of 1,000 people. All agencies had emergency plans prepared - indeed, the Fire Department Chief was in the process of revising his plan in the week before the derailment.

The Peel Regional Police Force's plan and response were of primary importance for the emergency as a whole: the police Disaster Plan was the only formally declared plan in effect for the week, and it provided the framework within which the rest of the emergency response developed.

The police plan, developed in conjunction with other emergency service agencies, calls for:

FIGURE 2.3 CONFIGURATION OF THE DERAILED CARS



SOURCE - GRANGE COMMISSION REPORT, 1980

- (a) alert of personnel;
- (b) the cordoning off of the affected area;
- (c) the smooth assumption of command;
- (d) the creation, if necessary, of a Command Post;
- (e) the alert and controlled entry of other agencies.

The circumstances of the derailment were such that cruising police units were alerted by the light of the explosion. The first recorded message at 11 Division is at 23:54:38, when Car 1111 reported in to the radio dispatch. Three or four police cars converged on the scene.

A constable who lived nearby was on the scene within a few moments, and a detective sergeant within five minutes. Traffic north and south bound on Mavis Road between Burnhamthorpe Road and Dundas Street was ordered blocked off by Detective Sergeant Kelly on-scene, who pinpointed the accident as being at the crossing. He used volunteers at the Mavis and Dundas intersection. Within three minutes of the derailment, police were requesting additional personnel to handle crowd control. All personnel from 11 Division, the division in which the derailment occurred, proceeded to the vicinity of the site to help with traffic and crowd control. Both 11 and neighbouring 12 Divisions held back all their shift personnel.

The Duty Inspector, Jim Kimber, was notified and proceeded to the scene to assume responsibility until the designated on-scene commander (Superintendent Ken Sider) could arrive. By midnight, then, much of the police Disaster Plan was already in operation, concentrating at this point on traffic control and the cordoning off of the affected area.

The high visibility and shock waves of the explosion made an initial alert of fire personnel unnecessary. Firemen at the Fairview Road Headquarters, less than a kilometre east of Mavis Road, saw the bright light, and were already putting on protective clothing when the first call came in. The dispatcher sent out his first call at 23:56 initiating a fan-out of calls, and requesting

assistance from area fire-fighting teams. Two pumpers and an aerial truck arrived within four minutes of the derailment, at 11:58.

Fire teams approached the scene separately from the north and south and, for the initial period, there was no communication between the two teams. Since the derailment contained propane cars, and there had already been explosions, the firefighters were prepared for BLEVE's. These explosions are particularly dangerous, not only because the heating up of propane in the cars and the subsequent explosion of escaping expanding gas can cause rocket-like hurling of tank cars for hundreds of metres, but because the 10 to 15 minute delay before the explosion occurs may lull people into approaching too close to the site.

The Fire Chief describes the initial fire response (Figure 2.4):

*"What we did was to get in and put some lines on as the BLEVE's started to happen. Each time there was a new BLEVE, we'd have to leave everything and run. We started with three deluge sets from each side, and some hand units to put out spot fires."*

The unmanned deluge sets worked automatically once they were set in place, and could pump 20,250 litres of water per minute on the fire. The difficulty was in getting close enough to the fire before another BLEVE occurred. Pumper trucks were sheltered behind buildings at some distance from the crossing, and firefighters had to lug hoses and deluge sets up to as close as 80 metres away before being able to turn and run to safety.

The BLEVE at 00:09 was preceded by a low whistling sound which gave a few moments warning. District Chief Ross Kelly, in overall initial fire command, and on the north side, warned the firefighters of the impending BLEVE through his portable radio. They ran for cover, jumping into ditches and under the pumpers, as bits of flying metal hurled by. Chief Fire Inspector Hare, in charge of the south units, was knocked down as he ran back.



Everyone was ordered to retreat beyond a radius of 450 metres.

District Chief Kelly noted:

*"My concern was to keep the fire contained to one area....to get major lines to contain it....and try not to have it move into the buildings."*

Back at the Headquarters, the alert of senior personnel, including Deputy Chief Art Warner, who would eventually assume overall command of the on-site firefighting, and Fire Chief Gordon Bentley, who would go to Headquarters to command the overall fire response from Operations Centre, continued. All the city and region fire halls were alerted. Some lent equipment to the site; others provided back-up support in case of need.

Ambulance services were also alerted by the initial explosions. Within four minutes of the derailment, four ambulances were dispatched from the Halton-Mississauga Ambulance Service to the site. Cruising ambulances in Toronto saw the bright sky to the west and notified Metro Toronto Ambulance Services, which sent its ambulance bus (capable of carrying 20 patients), **three** emergency support units and four ambulances to the scene, again within minutes.

At Mississauga General Hospital, the first explosion was felt by the staff working at the hospital. The emergency staff made preparations for an influx of patients. The second and third BLEVE's accelerated these preparations: patients in Emergency were treated by on-duty staff and sent home where appropriate; physicians and on-call staff began arriving; and the hospital Disaster Plan was reviewed. Halton-Mississauga Ambulance Services alerted Queensway General Hospital and Etobicoke General about the derailment. Finding no injuries on-site, ambulances stationed themselves strategically about the area to respond to expected casualties.

The BLEVE's at 00:09 and 00:16 not only destroyed a municipal recreational building and a number of warehouses nearby, but the shock waves caused window breakage and some structural damage to buildings within a 600 metre radius. The explosions



also temporarily scattered the army of onlookers who had become a major headache for the police and other personnel. Traffic converged on the area; residents came out of their houses and walked towards better vantage points; teenagers wandered down the tracks from both ends. Using police and ambulance P.A. systems, teams from 11 and 12 Divisions began cordoning off the area bounded by Burnhamthorpe Road on the north and Dundas Street on the south, to keep people back at least 600 metres. By 00:30, all the factories north and south of the derailment had been checked or evacuated.

#### 2.2.4 The First Command Post

Chief of Police Douglas Burrows was awakened at 00:19 by telephone, he asked that the Mayor of Mississauga and the Peel Region Chairman be alerted. Chief Burrows then proceeded to the scene, picking up his Deputy Chief, Wm. J. Teggart en route. At the same time, 00:19, the first police Command Post was set up outside a car wash south of the site on Mavis Road. The police requested that the Deputy Fire Chief, who was also approaching the scene, attend at this post. Police Duty Inspector Kimber arrived at the car wash at 00:20. The nucleus of the command structure that would co-ordinate the emergency response was now taking shape. Alan Duffin of Halton-Mississauga Ambulance Services and John Dean of Metro Toronto Ambulance Services were on site by 01:05 to co-ordinate ambulance response.

The greatest concern at this time was the potential explosion of further propane cars, visible through the flames and smoke. In addition, the Fire Department was concerned about the possibility that heat or embers would set off fires at nearby chemical storage tanks. The number of people available to fight the blaze increased from an initial 25 to 50 within a half hour, as fire fighters voluntarily reported in or were alerted by the call-back system of the department. At this stage, however, there was little to do except try and contain the blaze, and put out smaller fires scattered around the waste area near the railway crossing.

The immediate problem of containing the fire began to be overshadowed by uncertainty over what might be in some of the cars jumbled together at the crossing. The conductor of the train, Ted Nichol, had been thrown from his seat in the caboose and badly bruised by the abrupt stopping of the train when the middle section derailed. Picking himself up, he had grabbed the train's manifest, a carbon copy of a computerized sheet detailing in code the contents of the cars on the train. In his hurry, he left behind him the emergency handling instructions for dangerous commodities, documents required to be on each train. For the next few minutes, he set up warning flares some distance along the west side of the track. He also tried to warn onlookers back from the area. Then he proceeded to report to a police sergeant on Mavis Road. After some consultations, he was advised to go to Fire Department Headquarters, but was rerouted to the Command Post at the car wash. Numerous witnesses have reported that the manifest was virtually impossible to read under these conditions, and detailed analysis had to wait until the Command Post was removed to a new site, a Domtar building nearby.

One of the first acts of the Fire Chief upon reaching his headquarters was to request that CP Rail send a copy of the manifest to the scene.

The assumption then was that the conductor might have not survived the derailment, and a copy of the manifest arrived several hours later. The Fire Chief also contacted local propane experts, who confirmed the Fire Department's own standard procedure manuals. Other notifications in this period included the Transportation Emergency Assistance Program (see Section 3.2.4); the Environmental Protection Service of Environment Canada; and the Ontario Ministry of the Environment (MOE). The Duty Officer of MOE alerted Mr. Ron Graham of the Industrial Abatement Section who went to the scene at 00:20. At this time, a green haze was beginning to appear over the burning wreckage, and the first reports of chemical smells were made by firefighters and police.



### 2.2.5. First Emergency Meeting

At 00:47, Police Chief Burrows arrived on the scene with the Deputy Police Chief. In the previous half hour, there had been an attempt to locate a possible site for a new Command Post that would be able to accommodate the Police command trailer, complete with telephones and other equipment. Hydro had gone out in the area, and Mississauga Hydro was on scene to re-install power. It was decided to locate in a Domtar building not far from the car wash. Chief Burrows arrived there at 01:10. A first meeting was held among all the senior personnel available. Police Chief Burrows took overall command of the emergency, with Fire Chief Bentley taking command of the firefighting activities; Superintendent Sider became the designated on-scene commander of police activities; and Superintendent Barnhart was designated as Media Liaison Officer. Others at the meeting included Chief Fire Inspector Hare, members of the CP Railway Police, and Ron Graham from MOE.

Examination of the train's manifest began in detail: it appears that the CP Rail officials believed the chlorine car was not in the derailed section, either because there was a mistake in the manifest, or because it was difficult to determine which cars had actually derailed, since the front end of the train had, of course, proceeded to the Cooksville station by this time. Numbers and placards on the derailed cars had been burnt off or were difficult to read under the hazardous conditions.

Chief Burrows was dissatisfied with the assertion that the chlorine car was not in the derailed section, and he ordered a car-by-car visual check. This took 20 minutes, from 01:18 to 01:38, and revealed that the chlorine car was, probably somewhere in the centre of the derailed section of the train. A request that all personnel move back 600 metres from the scene was made, since further explosions were expected; and a request was made by one constable, at the direction of the Chief of Police, to central police communications in Brampton to contact

*"Emergency Measures Organization, Military or whoever, to get as many pressurized gas masks as possible".*

After consulting with CP Rail officials, Fire Department personnel, the MOE representative, and a Mr. Blondin of Ashland Chemicals (who had arrived to advise on chemicals), Superintendent Sider reported to Chief Burrows that the wind, blowing to the south-west, made an evacuation of the area west and south of the site - to Erindale Station and Dundas Street - advisable. At 01:47, Chief Burrows ordered the first official evacuation of this area under the direction of Inspector Kimber and Staff-Sergeant Crowell. Special emphasis was laid on prevention of panic. In the early stages, police went door-to-door, and were instructed to tell people that dangerous gases were on the train and they were advised to leave.

#### 2.2.6. Transit

Mississauga Transit was put on standby at 01:09. Buses were brought into the area to assist those who had no cars (02:23). At the peak, over 50 buses were used, though there was some initial difficulty in getting Transit moving: first, the transmission tower used by Transit was only 30 metres from the derailment, and was destroyed; next, workers reporting for duty had some difficulty with identification procedures at the newly established police cordon; and finally, there was a lack of emergency liaison procedure with the police.

The Transit Superintendent ordered buses to proceed to three locations near the area about to be evacuated; and the police directed evacuees to these collection points. Some of the buses were underused because the police had no information that several of these collections points were being used. Later in the morning, Mississauga Transit set up an improvised marshalling yard outside the evacuation zone to prepare for possible further evacuations. To replace the damaged communications network, telephones and CB'ers off the street were used initially by the operations manager, and then supplemented by electronic dispatch equipment brought from Streetsville.

### 2.2.7. Volunteer Agencies

The question of accommodation for those who had no friends or relatives in the vicinity became vital. As early as 00:30, police had contacted Mrs. Margaret Leslie, Emergency Co-ordinator of the Canadian Red Cross (Mississauga Branch). Police knew her well from previous emergencies, including the 1978 Texaco fire. She went to the Command Post, where Peel Police asked her to set up Square One Shopping Centre, just north of Burnhamthorpe Road, as an evacuation area. Police also received a call at 01:07 to the effect that Holy Name of Mary Secondary School, 3.3 kilometres southwest of the accident site, was available. Square One was officially opened as an Evacuation Centre at 02:17, and the first evacuees were directed there.

Other agencies, including St. John Ambulance and the Salvation Army, also began to mobilize their resources (see Chapter 4). By 03:30, the Mississauga Humane Society, with assistance from the Ontario Humane Society, finished evacuating animals from their shelter on Mavis Road, 150 metres south of the accident.

### 2.2.8. Media

Within 10 minutes of the derailment, Broadcast News, the Toronto Star, and Radio CHIC News had contacted the police department for information. Cal Millar, Police Reporter for the Toronto Sun, lives three blocks from the site, and was the first reporter on the scene. Like many other reporters that morning, Millar tried to get as close to the derailment as possible to take pictures. Most television networks had cameramen on the scene within an hour, although incoming traffic tie-ups caused some delay. The CBC had a crew on scene until dawn, when four additional crews arrived; CFTO had four cameramen and four reporters there at 00:30; Global had two crews on at 01:00; CITY TV's crew proceeded from the east side along the railway tracks at about 00:45, but the heat was so great that they had to

retreat. Yvan Secan, the station's news director, broke his leg jumping a fence (the only early casualty of the accident, it appears).

As early as 00:38, police officers were seeking advice from the on-scene commander as to what to do with the members of the media who were requesting closer access to the scene. First, a police supervisor was dispatched to a point at Mavis Road and Dundas Street to set up liaison with the media, and a staff sergeant at Headquarters had all media telephone calls transferred to his office.

It is Peel Regional Police policy that the press needs to be as close to the scene - within the visual range, if possible - as is consonant with safety; otherwise, camera crews and reporters begin to feel that they are not being given the truth. The police therefore tried to set up a Media Centre just outside the "high hazard" zone. The first official police/media centre was set up at a Ministry of Transport Weigh Scale parking lot, 1 kilometre south of the fire. Approximately 50 media members were on hand, and were advised at 01:56 that regular releases would be given based on receipt of information.

#### 2.2.9. Chlorine Response

Another priority was the location of expertise on the possible effects of a chlorine leak. Fire Chief Bentley had contacted CANUTEC (a 24-hour Federal chemical advisory service) for immediate information; and also got in touch with local chemical industry experts.

The CP Rail dispatcher in London alerted Plant Security at Dow Chemical in Sarnia at 01:49 of the derailment. Mr. Ron Johnson, Dow Emergency Response Co-ordinator, was called, and immediately set in motion Dow's chlorine emergency response (CHLOREP) team (see Section 3.2.4). Cyanamid was in the CHLOREP sector containing Mississauga, but they felt they were unable to

respond. Since Dow was prepared to go to the scene, and they were also the shippers of the chlorine, Dow's CHLOREP team was dispatched. The team left at 03:30, having notified CP London and the Mississauga Fire Department that they would arrive at 06:30 with their emergency vehicle.

In the meantime, the fire appeared to be gaining strength and approaching the chlorine car. Approximately 100 firefighters were now fighting the blaze. The Fire Department began with 3 ladder trucks, 7 pumpers and 2 squad cars, and added 2 more pumpers within hours; with 2 backup vehicles and 15 men (supplied by Etobicoke Fire Department) remaining at headquarters. The need for water prompted the Fire Chief to request an increase in pressure from the Waterworks Department. At 02:35, the Fire Department reported that the fire, for the moment, had been contained.

The Peel Regional Police Mobile Command Trailer arrived at 02:36 at the Domtar plant. Police requested Peel Region Industrial Waste, and Peel Region Works Department assistance. Other agencies began to augment their personnel and resources. The Ministry of the Environment official on-scene requested assistance from the Oakville office (03:50). Metro Toronto Police and Ontario Provincial Police stepped up their contributions (Metro began with 35 officers and reached 117 regular and auxiliary personnel by late Sunday morning; the OPP began with 13 vehicles and 17 officers and reached 154 members by Sunday's end). In addition, the R.C.M.P. offered their services, and 52 members were on scene throughout the week.

#### 2.2.10. Worsening Situation

The situation on site continued to deteriorate. Fumes from the styrene, toluene, and chlorine car were becoming stronger and stronger. Available gas masks were distributed to officers in the immediate area of the fire. At 03:21, the CP Rail



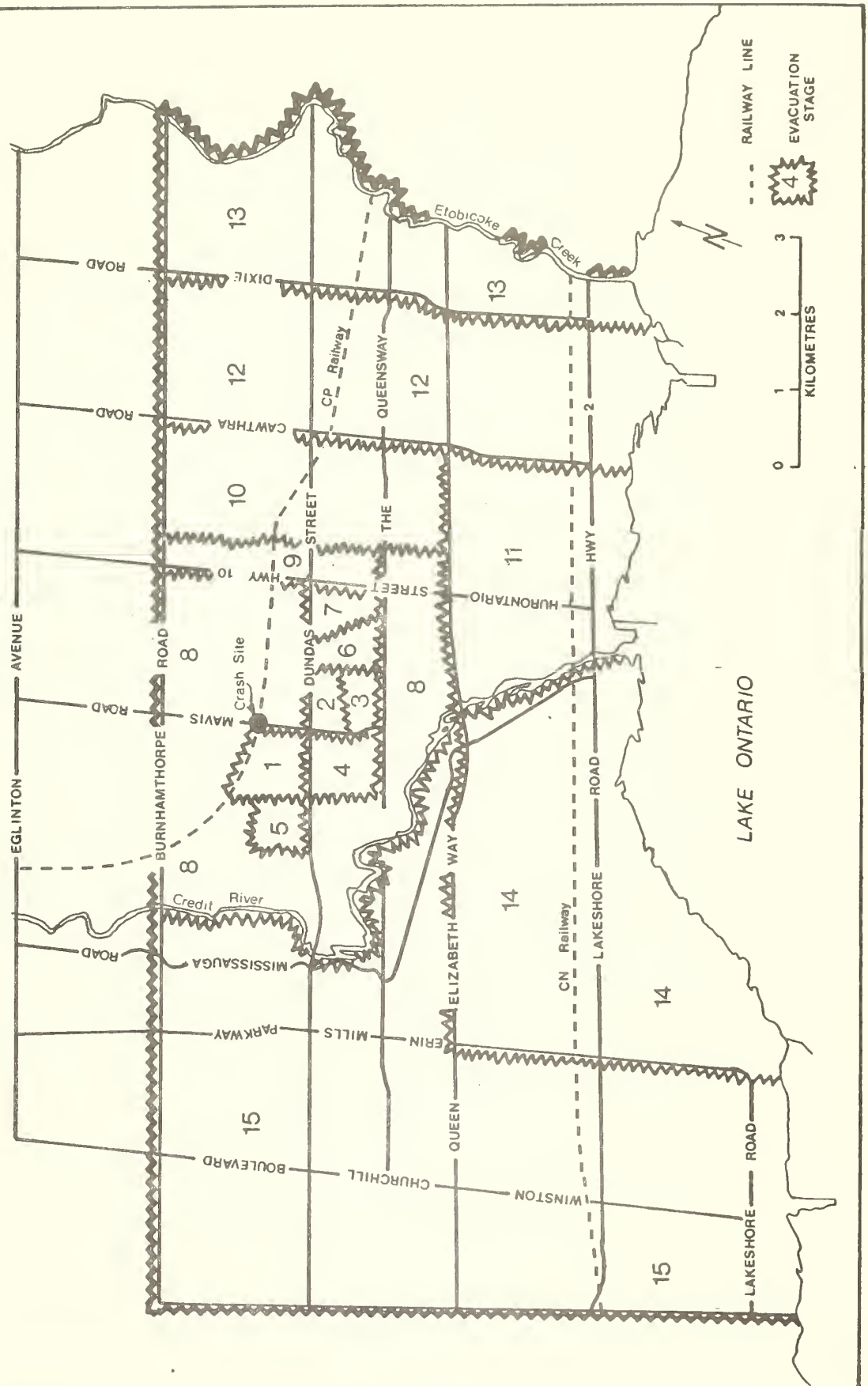
officials on-scene confirmed that the chlorine car was in the middle of the burning cars. Moreover, although the fire had generally been contained, it appeared that particular fires fed by spreading pools of propane were approaching the presumed location of the chlorine car. Operators of all police vehicles were instructed to park facing away from the fire in case of an explosion that blew open the car. Mississauga, Etobicoke, Queensway and Peel Memorial Hospitals were contacted by the police at 03:50, and were requested to stand by for possible inhalation casualties. The probability of a chlorine car as part of the wreck raised the spectre that a sudden explosion could trap emergency response workers in a rapidly spreading chlorine cloud. Supt. Sider, concerned about the chlorine danger, asked Mr. Ron Turnbull of Peel Region Industrial Waste, who had just arrived, to begin air samplings in the area with a Draeger tube sampler (a rough manual sampling system).

The first evacuation was now nearly complete. From the initial evacuation order (01:47) to the assigning of security details to the evacuated area (04:00), slightly over two hours had elapsed. The organising of platoons at staging areas, provision of response tactical vehicles, and transit for evacuees had taken approximately 45 minutes. It is therefore reasonable to state that the virtually door-to-door emergency evacuation of 3,500 people took from an hour and a half to two hours.

The wind, which had been blowing from the northeast, began to shift due north, and then northwest. A check at 04:09 with the Environment Canada weather office at Malton produced the forecast of winds between 2 and 4 knots from the north or northwest. Fumes were now so strong that the Mobile Command Trailer was moved to the east side of Mavis Road. The wind began veering in various northerly directions.

At 04:15, the second stage of the evacuation was ordered, involving 350 people almost directly south of the site (Figure 2.5). Slightly later, at 04:31, all supervisory personnel south of the site were themselves evacuated to the north of the site. Bell

FIGURE 2.5 THE EVACUATION ZONES



Telephone, Ambulance and Fire personnel, together with the Peel Police Mobile Command Trailer were relocated at a Bell Canada parking lot on Mavis Road, 500 metres north of the tracks. This would become the permanent site for the Command Post.

The size of the response operation required began to become apparent. Upon the setting up of the Police Command Post, the disaster plan calls for the creation of a "think tank" composed of senior police officers and on-scene advisors. This became the starting-point for an Emergency Operations Control Group (EOCG). Municipal and regional plans call for a Control Group of senior politicians to be set up in a declared emergency. Because the Police disaster plan was the only plan in operation, the name "Control Group" was applied unofficially to the gradually expanding "think tank."

The first political additions to the Control Group were the Mayor of Mississauga, Hazel McCallion, and the Chairman of Peel Region, Frank Bean. The Chief of Police had requested the notification of the Mayor and the Chairman, at 00:17, but it appears that Mayor McCallion called Police Headquarters at 01:34 of her own accord. Chairman Bean was not notified until much later; the Police chronology lists an attempt to contact him at 04:54, and a successful contact at 05:18. On the way to the site, Bean confirmed with Superintendent Barnhart that the Police plan had been put into effect, and that Mayor McCallion was also on the way. At this time, the Mobile Command Trailer was in the course of being transferred so there was a short meeting between Bean, McCallion and Barnhart on Dundas Street south of the site, at about 05:30. Bean recalls that their eyes were stinging and smarting all through the briefing. They were informed that more evacuations were probably necessary.

Following this discussion, McCallion and Bean went to the Evacuation Centres. Square One had become overcrowded by 04:25 and police were sent over to help with crowd control. Several thousand people were now there, and it became imperative to open new facilities. Police had contacted the Peel Board of Education at 01:29 to have



schools put on standby for use as Evacuation Centres. At 05:00, police received agreement that Erindale Secondary School would become the second major Evacuation Centre, 4 kilometres due west of the site, at Erin Mills Parkway and Dundas Street. Ambulances were dispatched to both centres in case of need.

Local Red Cross and St. John Ambulance groups also realised that the situation demanded reinforcement, and contacted their respective Ontario headquarters (see Section 4.3). At 05:00, Chief Burrows asked that Peel Regional Social Services be informed of the derailment. Attempts to reach the Social Services Commissioner failed because of a breakdown in both the Regional fan-out alert system and in communications between the Police and the Regional telephone answering service. Within an hour of the derailment, however, Metropolitan Toronto Social Services phoned and offered assistance. Their Director of Senior Citizens' Apartments, George Coleman, who was in charge of Metro emergency lodging, was alerted at 04:00 by Peel Police about the possible evacuation of several seniors' facilities in Mississauga.

By 05:58, evacuation stage 2 had been completed. Fumes were now trailing farther and farther downwind, and there were reports of thick smoke from various points to the south and southwest of the site. The stage was now set for a series of evacuations. At 06:20, evacuation stage 3 was ordered; and at 06:30, stages 4, 5 and 6. Approximately 8,000 people were scheduled for evacuation in an area roughly 2.4 kilometres in diameter around the derailment site, with the exception of an area to the extreme northwest.

In the initial and most hazardous zones, police had been careful about street-by-street and even house-by-house alert. With the expanding zones, however, the mixed group of Peel, Metro and Provincial Police began relying more and more on the sound trucks, which went through the streets warning of the danger, and giving out instructions (e.g. assembly points for those without automobiles). In addition, as it began to get lighter, the police were aware that getting people out of their homes would be substantially easier.

#### 2.2.11. Evacuation of Mississauga Hospital

At the same time as the new evacuation stages were announced, Mississauga General Hospital - having been on alert all through the pre-dawn hours awaiting casualties - was informed at 06:50 that it might have to be evacuated. It was now becoming possible to see thick black smoke drifting straight towards the hospital on the edge of the now evacuated area (stage 6 at Queensway near Hurontario). At 06:41, Queensway, York-Finch, Etobicoke, Humber, St. Joseph's, Northwestern and Sick Children's Hospitals were canvassed by ambulance services for space for 500 patients including 50 babies.

The Dow Chemical CHLOREP team was now on-site, and in conjunction with the Fire Department, confirmed (by 07:22) that the chlorine car was in the wreck, and that there was a small leak in it at the bottom of the tank.

Sometime after 07:30, the first meeting of Emergency Operations Control Group was held at the Bell Canada site. Chief Burrows, Fire Chief Bentley (who came on scene for the meeting), Mayor McCallion and Chairman Bean were the key actors, with Ministry of the Environment officials, the Dow Chemical personnel and others being present.

According to the Peel Region Emergency Plan, the Emergency Operations Control Group should now have declared an emergency (Section 3.2.1). As it was, the Police Disaster Plan remained the plan in force. Chairman Bean has noted that they were under a quasi-military operation from the police and that the politicians fitted into that approach.

The decision to evacuate Mississauga General Hospital was perceived by most of the participants in that decision as a watershed (Section 3.3.4). What followed is a subject of some controversy, since the hospital report and the police transcripts do not mesh. It appears that Chief Burrows ordered the evacuation of the hospital at 08:30, and that the clearance of the evacuation routes and marshalling of ambulances began at 08:45. Senior ambulance staff

and ambulances converged on the hospital. However, the President of the hospital refused to evacuate the hospital until formal word had been received from the Police Chief. Although there are three reported announcements of evacuation events to the hospital in the police chronology, it seems that a formal call to the President of the hospital by the Police Chief was not made (in fact, the responsibility for confirmation had passed to the Police Executive officer and Deputy Chief).

At approximately 09:15, Al Duffin of Halton-Mississauga Ambulance Service, and John Dean of Metro Toronto Ambulance Service arrived at the hospital to help co-ordinate the evacuation.

The President of the hospital called the Command Post and discovered that the Police Chief had gone up in the OPP helicopter over the site and could not be reached (09:00-09:25). The Deputy Chief was located, and confirmed the evacuation. Evacuation then began of the 186 patients who had not been discharged out of an original 479. Red Cross and St. John Ambulance were called in to assist. The evacuation was completed by 13:30, or four hours after it began. At 10:00, 202 senior citizens from the nearby Extendicare Nursing Home were evacuated, and 237 were moved from the Chelsey Park Nursing Home an hour later. Residents were taken to facilities in Milton, Brampton, Streetsville, and Toronto (Table 4.3).

#### 2.2.12. Provincial Alert

With over 10,000 people evacuated, more senior levels of government began to be alerted, occasionally through official channels, and occasionally through a more casual - and often more effective - network of working associates and colleagues. The senior levels of the provincial Solicitor General's office, and the Ministry of the Environment were alerted in various ways described in detail in Section 3.3.4

The Solicitor General (the Honourable Roy McMurtry) is the senior peace officer in the province, and as such has primary responsibility for the security of life and property. He was informed by his

Deputy Minister of the derailment between 06:00 and 07:00, and proceeded to the site, arriving at 09:28. According to the procedures under which the Ontario government operates, particular ministries with special expertise are tasked with emergencies (for instance, the Ministry of Health deals with epidemics), and each ministry becomes the "lead ministry" in any situation that has gone beyond the initial, local capacity to respond. In this case, although the Ministry of the Environment would seem to be the responsible ministry in the event of a chemical spill, the seriousness of the threat to life in the area made the emergency the responsibility of the Solicitor General (see Section 3.2.).

However, the Ministry of the Environment rapidly became involved in the response to the emergency, one of its early tasks being the checking and denial of a persistent rumour that polychlorinated biphenyls (PCBs) were in some of the wrecked tank cars. Mississauga Mayor Hazel McCallion and many others called the MOE 24 hour Emergency Service to ask about this rumour, which was denied first at 04:10 and again at 07:07.

The origin of the rumour is not known, but it is not difficult to see how it came about. Mississauga has been the scene of a protracted debate about the use of the kiln at the St. Lawrence Cement Plant to conduct trial experiments in the burning of PCBs.

The Ministry of the Environment's technical branches do not see themselves as primarily emergency services, and are geared towards slow laboratory analysis of environmental problems. Results from samples taken with their usual High Volume Sampling equipment take a week or more, and are therefore of limited use when time is of the essence. However, thanks to the development of a Trace Atmospheric Gas Analyzer (TAGA) by Sciex Ltd. of Toronto, MOE had a unique capability to provide virtually instantaneous monitoring in the Mississauga emergency. One TAGA vehicle was already in Mississauga to monitor experimental burning of PCBs. Another, at Sciex, had just been calibrated to detect chlorine. It was therefore possible to calibrate both vehicles rapidly. Even with these advantages, the TAGAs did not arrive on scene until Sunday afternoon.

Even with monitoring vehicles available, there were no gas masks available for the crews of the vehicles. Gregg Van Volkenburgh and Tom Cross of MOE spent much of the time between 08:00 and 10:00 organizing crews and trying to locate masks. Eventually, masks were located at the Sewage Treatment Plant at Lakeview, but permission from the supervisor was needed before they could be taken: and when they were finally taken, it was discovered that they were inadequate. Masks were eventually borrowed from the Fire Department.

In the meantime, Cross contacted Garnett Kay of the Contingency Planning Section of MOE, who immediately went to the site. He also contacted Dr. Max Fitch, of the Ministry of Labour's Special Studies and Services Branch. Dr. Fitch is on the inter-ministerial committee for emergency planning, and has expertise in industrial emergencies. He was asked whether he would be available to answer questions. Fitch in turn contacted his Deputy Minister and then tried to get in touch with the local Medical Officer of Health, Dr. Lillian Cherkas. She arrived at the site at 10:30, joining Clifford Clark, Director of the Environment for the Peel Regional Health Unit who had come to the site at 08:00. Liaison with the Ministry of Health was established by Dr. R. J. MacBride of Emergency Services Branch, who proceeded to the site in the early afternoon.

Peel Regional Police notified Halton Regional Police of the situation at 08:00. An open phone line was set up between the Command Post and Halton Regional Police Headquarters. Halton Police put local transit companies on standby to assist in evacuation, and contacted Jack Porter, President of Sheridan College, to ask that the Oakville campus be available to take evacuees if needed. They maintained contact with the Command Post throughout the day.

At 06:00, the Regional Director for Ontario Emergency Planning Canada, Denis Amyot, was advised by National Defence through the OPP that Ontario had made a request for manpower and for foam pumpers and respirators. One pumper was dispatched from Downsview,



and 32 Chemox respirators (oxygen masks) were obtained from Camps Borden and Downsview. He continued to maintain contacts with federal and provincial departments for the next few days, concerning himself with the location and supply of respirators and other equipment, should National Defence personnel have to be called in.

The Captain of the Regular Armed Forces at Downsview was called to the scene, and was asked if he could provide up to 250 personnel. He advised that there would be a substantial delay in getting troops from London and Petawawa (on a holiday weekend); and, moreover, that the use of regular forces in a peacekeeping or law-enforcement capacity in a non-war zone would require a declaration signed by the Federal Solicitor General. It was decided to use men from surrounding police forces instead. The Brampton Militia Unit (commanded by Lt. Col. L. H. Smith) was engaged in an exercise at the time, and volunteered their services to the OPP Headquarters in Port Credit. At 14:20, it was decided that the militia was not required, and the unit returned to Brampton.

#### 2.2.13. Properties Of Chlorine

The main danger of chlorine derives from its properties as an oxidizing agent, reacting with the water on the moist linings of bronchial and lung tissue to form hydrochloric acid. Following a release of chlorine into the atmosphere, ground concentrations can become very high, since chlorine is 2.5 times heavier than air, and therefore creeps along the ground or forms low-lying pools in cavities or depressions in the land.

In Ontario, maximum acceptable exposure in the workplace (8 hour day) is 1 part per million (ppm). At 3 ppm (over 15 minutes) and above, irritation of the eyes begins, followed at higher doses by coughing, vomiting and tissue damage, until, at about 900 ppm, death occurs rapidly. The 1 ppm workplace hazard

level was divided by 100, which was thought sufficient to guarantee protection for the elderly, those with respiratory diseases and children. This level, equivalent to 30 micrograms per cubic meter ( $30 \text{ ug/m}^3$ ) was exceeded around the site on a number of occasions during the week. As we shall see, some of the week's events were based on the possibility that over  $18,000 \text{ ug/m}^3$  (or 6 ppm) - which would cause "physical embarrassment" - might be found up to two miles from the site, following a rapid release of the remaining chlorine. In general, the following criteria were used as ambient air standards:

Normal background	- less than 0.001 ppm or $3 \text{ ug/m}^3$
Discomfort level	- 0.01 ppm or $30 \text{ ug/m}^3$
Acceptable workplace exposure (8 hours)	- 1.0 ppm or $3000 \text{ ug/m}^3$
Health threat threshold level (15 minutes)	- 3.0 ppm or $9000 \text{ ug/m}^3$
Acute danger to human life	- 900 ppm

#### 2.2.14. The Command Post

By the time of the arrival of the Solicitor General at the Bell Centre north of the site at 09:28, most of the key actors and agencies were either at Mavis Road or alerted to the situation. In the parking lot of the Centre, the Peel Regional Police Mobile Command Trailer, the Metro Toronto Police Trailer and the OPP Trailer were set up and hooked into Hydro and telephone services. The early meetings of the Control Group before and after McMurtry's arrival, took place in the Peel Trailer.

The other agencies found room in the ground floor of the Bell building itself, once the door was jimmied open. There were three available phone lines, and the rapidly growing army of officials were forced to take turns reporting to their officers. On Sunday morning, groups of two and three people would hold meetings in various corners. The Solicitor-General would start talking to one or two people, whereupon hordes of people would gather, following which he would escape, only to be confronted by the next group.

On the east side of the road, across from the Bell Centre, the media were set up in a truck depot. Through Superintendent Barnhart, media releases and information were given out to the media at various intervals. Well over 100 reporters and cameramen had converged on the scene by Sunday noon, and more media liaison was required. Enough information was given out to make sure that residents tuned into their radios and televisions, and the information was designed to leave the impression that the boundaries of the evacuated area would be extended, if at all, in graduated sections.

McMurtry had scarcely arrived when a new BLEVE occurred at 09:50. It confirmed the need for the three further evacuation stages that had already been ordered at 07:29, 08:30 and 09:40: stages 7, 8 and 9, involving 30,000 people in an area bounded on the east by the Credit River, on the south by the Queen Elizabeth Way (QEW), on the north by Burnhamthorpe Road and on the east by Camilla Road and Cooksville Creek, were now officially evacuated.

#### 2.2.15. Evacuation Centres

Nearly 45,000 people were now on the move, and the need for new Evacuation Centres became apparent. In addition, Holy Name of Mary Secondary School had to be closed down as a Centre when the boundaries of the evacuation expanded, at 06:39. Sherway Gardens Shopping Mall in Etobicoke was opened as an Evacuation Centre by noon. The Peel Board of Education opened Streetsville Secondary School at 13:00, to receive evacuees from Square One and elsewhere. By 15:00, the Board of Education's Superintendent of Business Affairs opened an Operations Centre at the Board's Kennedy Road field office in Brampton. By Sunday evening, the Board had opened three more schools in Brampton and two in Malton, in response to the expanding boundaries and the evacuation of Sherway Gardens and Erindale Secondary School early Sunday evening.



Both campuses of Sheridan College, in Oakville and Brampton, were also opened by Sunday night, as was the International Centre in Malton, which sheltered the largest number of evacuees. In addition, a number of smaller Centres opened throughout the day on their own initiative and, in most cases, alerted Peel Regional Police of their availability. Other places were offered as centres, but were never needed (for a listing of the Evacuation Centres and their location, the times of their opening and closing, and the numbers of evacuees they handled, see Table 4.1 and Figures 4.1 and 4.2).

Many evacuees came to the Centres as a temporary stopping place en route to stay with relatives or friends; others stayed for the duration. It is estimated that 14,000 passed through or stayed in the centres during the week (See Section 5.10). The opening of the Centres created a rapidly growing demand for organisation, registration of evacuees, health care, food, and general assistance to evacuees. Numerous volunteer agencies and community groups, as well as Peel Regional Social Services and the Peel Regional Health Unit, responded to this need, as documented in Section 4.3. The Red Cross had 14 branches from Cobourg to Hamilton in service at Evacuation Centres by the end of the emergency, and another 14 on stand-by. Bell Telephone established lines to many of the centres, and the Amateur Radio Emergency Service (ARES) network provided radio communications to ease the burden on overloaded phone lines. St. John Ambulance, the Salvation Army, and the Boy Scouts and Girl Guides were joined by numerous local service clubs and churches in providing much needed assistance and support at the Centres.

#### 2.2.16. Monitoring at the Site

At the site, the officials responsible for the exodus were still, for the most part, working from their judgment of the obvious hazard. Environmental monitoring was at a rudimentary level; testing and sampling of air and water near the site

continued through the morning. The first mobile sampling unit arrived at 10:00 and was immediately sent out for a first sampling of total hydrocarbons, oxides of nitrogen and sulphur dioxide.

The last hours of Sunday morning and the first of the afternoon were an unsettling period: first, a wind change imperiled the Command Post itself, and plans were made to move to 12 Division Headquarters at Dixie Road and Eglinton Avenue. Second, it was realised that Square One Evacuation Centre was much too close to the site. The same scare that nearly forced the shifting of the Command Post, caused an advisory warning to be given to the evacuees at Square One to stay indoors. At 11:00, a call went out from Metro Police to the public for breathing equipment - a call which was later rescinded when Fire Department officials found they had enough to handle the existing situation.

#### 2.2.17 Further Evacuations

At about 11:00, the decision to evacuate Square One Shopping Centre was made, and buses began arriving at 11:35. Although Square One was evacuated between 12:00 and 14:00, with evacuees being sent to Sherway Gardens and Streetsville Secondary School, the residential areas around Square One were not evacuated, either then or later; in fact, the boundary of the evacuation zone never extended north of Burnhamthorpe Road.

Two further evacuation zones, 10 and 11, were announced, at 11:10 and 13:10 respectively. Mississauga east of the Credit River and west of Cawthra Road was now evacuated, adding another 45,000 evacuees to the ever-growing list. As the afternoon progressed, the evacuation boundaries moved eastward to Dixie Road (evacuation 12) and finally to Etobicoke Creek (evacuation 13) at 17:00 and 17:10. This put the evacuated population over the 150,000 mark, and brought the area evacuated to over 60 square kilometres. At 15:45, the decision was made to evacuate Queensway General Hospital, 8 kilometres away in Etobicoke, although the hospital's Executive Director, Kenneth Box, was

reluctant to carry out an evacuation. However, he was advised, partly on the basis of models of potential gas dispersion that in the event of a further explosion, there would be only 15 to 20 minutes to evacuate. The evacuation took slightly over four hours, being completed at 20:00 Sunday night.

At about the same time Queensway Hospital was finally evacuated, the decision was made to evacuate three homes for the aged scattered throughout Mississauga. The Sheridan Villa, Pines, and Carmel Heights homes for the Aged had 357 people evacuated by 23:00; the Taara Nursing Home was also evacuated that evening.

The winds continued changeable. Late in the afternoon (18:15), the Federal Atmospheric Service (AES) put a weather balloon centre on-site to take measurements of vertical wind and temperature profiles. Much of Sunday was spent by AES attempting to put together the material for this emergency unit from various sources. Weather data could finally be delivered every two hours to the Command Post.

At 18:40, Evacuation Centres were advised by the Command Post that evacuees would not return home Sunday night. The Control Group made two more large scale evacuation decisions in the evening, based on a weather forecast predicting a wind shift to the east (that is, blowing from east to west). This meant that areas far to the west of the site might have to be evacuated at night. To forestall this possibility, the Command Post ordered evacuations stages 14 and 15 at 18:45, and 20:16, taking in the rest of Mississauga south of Burnhamthorpe Road.

The evacuation boundary was now at the edge of Oakville. At 18:00, the Halton Regional Police Chief, James Harding, had been advised by Peel Police that part of Oakville might have to be evacuated. He had called a senior management executive meeting, after which he ordered in police reinforcements. Four high schools in Burlington had been alerted, through the Halton Board of Education, to be on standby to receive possible evacuees.

(Sheridan College, Oakville, was already receiving evacuees from Mississauga.) Burlington Red Cross had been notified of these plans. At approximately 20:00, a meeting was held in Mayor Barrett's office in Oakville with the Police Chief, the Hospital Administrator of Oakville-Trafalgar Memorial Hospital, John Dean and Robert Armstrong of the ambulance services, and Dr. MacBride to decide on the evacuation of the hospital and the Oakville Extendicare Nursing Home. It was felt that unfavourable winds and a BLEVE could cause excessive concentrations of chlorine within a 30 kilometre radius (i.e. including the facilities).

Orders were subsequently issued to evacuate Oakville-Trafalgar Memorial Hospital and the Oakville Extendicare Nursing Home. M.M. Robinson School in Burlington was asked to be prepared as an evacuation centre. At 23:30, the Chief ordered the evacuation of that part of Oakville bounded by Winston Churchill Blvd. on the east, Highway 5 on the north, Maple Grove Avenue on the west, and the lake on the south. People requiring shelter were directed to M.M. Robinson School; Sheridan College, Oakville, was full by this time. At 01:30, the Syl Apps Training Centre (50 children), the Oaklands Centre (150 retarded people), and the home and apartments of the Oakville Association for the Mentally Retarded (31 people) were advised to evacuate by Halton Police. They did so, even though they were outside the evacuated area. All evacuations were complete, and the QEW and Highway closed eastbound through the evacuated portion of Oakville, by 04:10 Monday.

By the end of Sunday, approximately 226,000 people had been safely evacuated out of Mississauga and environs. Late in the evening, a contingency plan for the possible evacuation of Malton Airport was devised; it called for the evacuation of all travellers and staff within one hour. Ground transportation vehicles and the RCMP stood by. The airport tower was prepared to close down at 15 minutes notice. Airport officials scheduled a morning meeting (08:30 Monday) to decide whether evacuation would be warranted by a predicted mid-morning wind shift. In the event, there was no evacuation.

## 2.3 MONDAY

The evacuated area was declared closed by Mayor McCallion at 00:30, so that no school, factory or business would open in the morning. At 01:30, Chief Burrows put the western part of Toronto and Hamilton on the alert for possible evacuation. Schools had already been advised of closure at 08:30, by the Peel Board of Education. Road closures, including the Queen Elizabeth Way, were implemented gradually after midnight. GO trains were cancelled through Mississauga. Regular police patrols moved through the streets, and an OPP helicopter stood by to search for looters. Approximately 500 police were on duty; Metro, OPP and RCMP officers assisted Peel Regional Police. Two hundred and twelve of these manned cordon posts at every intersection. The police sent in plainclothes officers to test the effectiveness of the cordon. Two out of four succeeded and the holes were closed. Superintendent Barnhart warned that anyone caught inside the City without authorization would be arrested.

Although firefighters and local medical officers of health have statutory powers of evacuation, police do not (that is, their power may derive from common law): at this stage, they relied on their powers of arrest for obstruction and interfering with an officer in the pursuit of his duty. It was thus a use of "de-evacuation" power, since once residents were out, they were not allowed to return.

### 2.3.1. The Holding Operation

Through Sunday night and into Monday morning, the Fire Department strategy remained the maintenance of a controlled burn on the propane tanks, to ensure that as much liquid product as possible was eliminated. At 08:00 Monday, two propane tank cars were still burning near the chlorine car, which was now discovered to be upright and slightly tilted to one side. Chlorine readings 500 metres downwind from the site were 20 to 30 ug/m<sup>3</sup>.



The MOE representatives on-site gave a weather forecast update to the police command at 08:20 - winds from the north at 6 km/hour, swinging to the east and south during the day.

Two gas-masked members of the Dow CHLOREP team, Greenwood and Jones, went down to the chlorine car at about 10:00 in the morning. While the chlorine rolled out past them, they put their heads into a jagged hole 1 metre in diameter. Using a stick to poke around, they discovered that there was 10-20 tons of chlorine left in the tank, 1.5 metres below the leak opening. The chlorine was covered by a layer of 15-30 centimetres of ice, formed by the self-refrigeration of chlorine ( $-34^{\circ}\text{C}$  under normal pressure) and a slushy layer of water from the fire hoses. Around the edges of this ice layer, the green chlorine was vaporising at a rate of 23-45 kg/hour. The Dow team took photographs of the configuration of the hole, which extended over the lip of the car edge and down the side. Greenwood then went to Procor Ltd. in Oakville to get a 1.3 x 1 metre steel patch prepared to cover the hole.

By Monday afternoon, relationships between the police, media and emergency services assisting the evacuees had stabilized, and the first indications of a longer term siege operation began to appear. There was an erroneous report on CBC at noon Monday that Etobicoke was now being evacuated; but, in general, reporting was accurate and responsible. Regularly scheduled press conferences and 2 tours of the "ghost town" were provided for the greatly expanded news corps - now including American and European representatives of television and newspapers.

The agencies on the scene moved into a holding operation while they waited for the fires to go out and for the patching of the chlorine tank to begin; Peel Regional Police consolidated their operation by moving from their 11 Division station in the evacuated area (leaving staff-sergeant and duty constable behind) to 12 Division, northeast of the zones. Peel, Metro and RCMP operations used this as their staging area.

At this time also, lachrymators ("tear gas") were forming from the interaction of the pool of water, chemicals and sunlight around the site. Witnesses report that the effects began to be felt at the Command Post, and there was talk of moving back. The first relief of staff who had been working for 24 hours was made, and a new series of higher level officials began touring the site, including OPP Commissioners, Chief Adamson of Metro Toronto Police and provincial politicians. For MOE and AES, the second day was also a period of consolidation and relief, with monitoring continuing throughout. A duty officer and shift system were set up, with wind forecasts to come every three hours. Regional and provincial MOE personnel reviewed various strategies for containment of the chlorine.

The Command Post was itself re-organized, as the second floor of the Bell Building was finally opened. Telephone lines were opened through the building. Monday saw the formation of a more structured Emergency Operations Control Group. Certain people were requested to be available for meetings - for instance, Dr. Fitch from MOL to answer questions on implications of chlorine and other chemical exposures. The Bell boardroom became the home of the Control Group "think tank". Chief Burrows and others had complained about the mass of officials who were beginning to clog up the meetings, and it was decided to limit the size of the think tank group. A list of a new, smaller group was read out at a meeting Monday afternoon. (See Appendix 8).

For evacuees in the Evacuation Centre, Monday marked the beginning of their long wait. At the International Centre, Sunday night and Monday morning had brought two scares: late Sunday evening, a baby with a possible case of scarlet fever was discovered, resulting in a 90-minute quarantine order; and at 08:30 Monday, an announcement was made that no one was to be allowed to leave the building due to the danger of a sudden explosion of the tank car.



At 15:45 Monday, the Assistant Deputy Solicitor General confirmed that Canadian Forces troops would not be requested, but did call for additional air pack respirators. At 16:45, the military advised that 85 respirators and 65 spare canisters were available in Halifax; they were airlifted to the site by early Tuesday morning. Late on Monday afternoon, a standby warning to residents of Streetsville and Meadowvale to the northwest of Mississauga was issued.

CP Rail announced Monday that it would, as a gesture of goodwill, pay the out-of-pocket expenses of the evacuees (Section 8.5). The Ontario Legislature opened its Monday session with a motion commending the authorities in Mississauga for their handling of the evacuation. In Ottawa, Transport Minister Don Mazankowski announced that he would introduce new legislation in 10 days to regulate the transportation of hazardous materials.

## 2.4 TUESDAY

### 2.4.1. Applying the Patch

Tuesday morning at 03:47, the remaining fires were finally extinguished. The CHLOREP team arrived on the site at 06:10, preparing to patch the tank. Their initial plan was to place the patch over the hole to achieve enough of a vacuum seal to make it possible to pump out the chlorine into tank trucks of caustic soda (neutralizing the chlorine). Through the day the team worked, first ripping away obstructions and insulation, then applying the patch, and finally trying to eliminate leaks around the edges.

At 08:20 Tuesday morning, the Control Group began a session to determine whether some of the evacuees might be allowed to return home. It has been reported that this was one of the most difficult sessions of the entire emergency, first because political pressure was mounting on the participants;

second, because evacuees who had assumed they were leaving for 24 hours or less (see Table 5.3) were beginning to harrass police at barricades. Monday night had seen problems, according to Superintendent Barnhart, and although no one had been arrested, those who tried to re-enter could have been charged with obstructing police. A further complication was the number of residents who wanted to return to feed pets. After 17:00 Monday, police allowed residents who checked in and out to go in for their pets. The Humane Society began taking names and addresses of those who wished their pets fed, and the Humane Society's 10 vehicles were in operation beginning on Tuesday. This replaced the system of allowing residents access to the area.

The feeling in the Tuesday morning Control Group meeting was that the problem would be solved by the end of the day. Outside the meeting, Van Volkenburgh of MOE, in light of the revelation that much of the chlorine had been ejected in the initial explosion, asked his modellers to do some back-casting about the possible characteristics of that initial plume. An eyewitness fireman had already reported that he had seen green smoke at the top of a 3,000 to 4,000 foot flame.

The results of the modelling suggest that the situation in the first few minutes after the derailment may have been as follows: the derailed chlorine car slowly heated up, to the point where it blew open, and the pillar of fire and heat sucked the majority of the chlorine in the car to a high altitude, dispersing it over a wide area. Reactions to something in the air had been reported outside the evacuated zone at various points in the circumference. Ultimately, at about 100 kilometres from the site, concentrations would return to background level. As the fire died down, the escaping chlorine would have descended, This would account for the reports 4 to 5 hours after the derailment of problems from personnel near the scene.

#### 2.4.2. First Re-entry

At 13:15 and 15:00 Tuesday, it was decided to let approximately 125,000 evacuees return to two areas (Dixie Road to Cawthra; Cawthra to Highway 10) outside the boundaries marked by Highway 10 (east) and Erin Mills Parkway (west) (Figure 2.6). Police hoped that there would be an orderly return, but erroneous media reports (even though quickly corrected by media relations officers) resulted in a massive seven-hour traffic jam of evacuees who were allowed to return and other evacuees who erroneously believed that they could return.

*"Cars were all over the place and across the boulevard and everything."*

Police said,

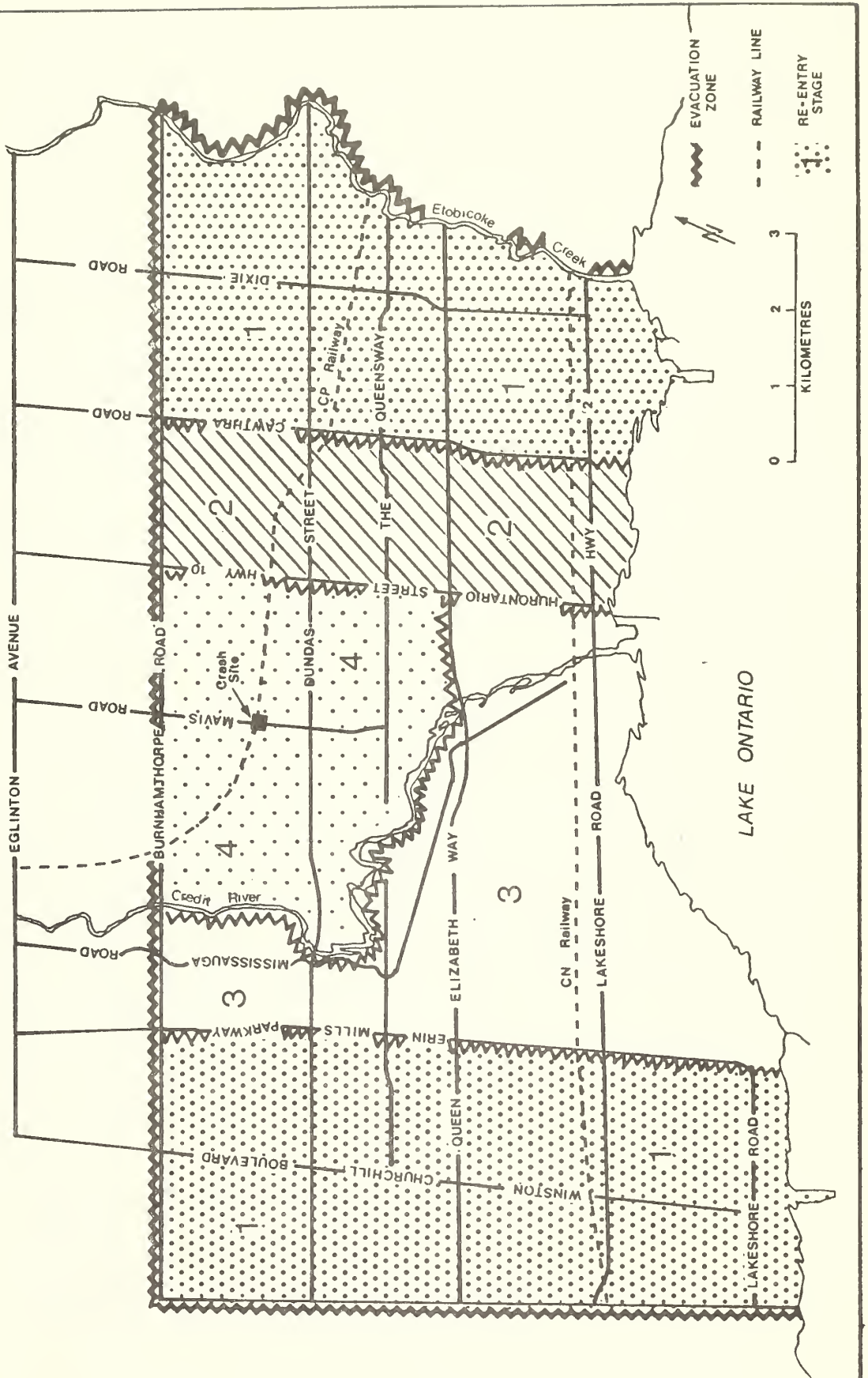
*"People were giving us a rough time. Motorists were losing their tempers."*

Patients were also allowed to return to Queensway General Hospital and Oakville-Trafalgar Hospital. During the re-entry, it was reported that concentrations of gas were found in certain areas, and Fire Chief Bentley told all returnees to open their windows for 15 minutes upon their return home.

With the re-opening of part of the evacuated area, the numbers of people in evacuation centres declined, and it was decided to consolidate them by sending evacuees from a school in Brampton, the two schools in Malton, and Vic Johnston Arena in Streetsville, to Streetsville Secondary School on Tuesday afternoon and evening. M.M. Robinson School was closed later on Tuesday evening, as its evacuees all could return home (see Figure 4.1 and Table 4.1).

On Tuesday evening, John Magee, Chairman of the Rail Safety Advisory Committee of the Canadian Transport Committee (CTC), told the House of Commons Transport Committee that it had been an overheated axle bearing which had caused the accident. It was also announced by the Minister that the CTC would hold an inquiry beginning December 4, 1979.

FIGURE 2.6 THE RE-ENTRY ZONES



Meanwhile, all was not well at the chlorine car. When a vacuum of 34 kPa was applied, the patch leaked. Work was also complicated by the presence of an adjacent car. The CHLOREP team began to apply air bags, caulking with putty, and jamming wedges at leak points. Since propane cars nearby were going to be moved away Wednesday at 08:00, the CHLOREP team decided to work through Tuesday night trying to fix the leak. The patch was reworked, using a hot saw, and reapplied. Air bags, neoprene, blocks of timber and putty were arranged in various configurations. At 08:00 Wednesday, the patch was still leaking slightly, but was stabilised. Exhausted, the team went to bed, leaving behind a crew member to watch the continuing transfer of vapours into the tank truck. Before they left the site, a request for more manpower was made to Dow head office.

## 2.5 WEDNESDAY

### 2.5.1. Revising Tactics

By Wednesday morning, the failure of the patch, and the pressure of the remaining 70,000 evacuees, had begun to erode the prevailing spirit of teamwork. At this point, an accident occurred which intensified the growing concern of the Control Group about on-site procedures. Because the chlorine team was not on site, a Superior Propane team (which was trying to drain and remove an adjacent propane tank car) instructed the fire fighters to play their hoses on or near the chlorine car. A large puff of water vapour or chlorine mixed with water vapour was given off at 12:25. The Fire Chief ordered all work at the site stopped:

*"I was concerned because everybody was just doing their own thing. The CP Rail people were pulling out cars, the propane people were doing something. All the chemical people were in there and they were going to roll the chlorine tank over and that could have caused sparks."*



As a result of these concerns, the Dow CHLOREP team came in for some tough questioning at the Wednesday afternoon Control Group meeting, the upshot of which was that the team's activities would be subject to vetting by the Ministry of the Environment, and a team member would be on-site 24 hours a day. The meeting did, however, agree to allow the continued removal of propane cars, satisfied that the patch on the chlorine tanker had not been damaged.

The CHLOREP team had now been augmented by three new Dow experts. Out of the technical meetings, there evolved the idea of reverting to the standard industry technique of evacuating the chlorine from the tank car. In addition to the vapour lines already working, Hamlin suggested using an adapted septic truck, which would be partially filled with caustic soda, to suck on the vapour connection. It would also be possible to do the same for a liquid transfer - pumping out the remaining chlorine in liquid form.

There was still a leakage of approximately 14-45 kg. of chlorine per hour from the tank car, and the team was scheduled for a work period through Wednesday night and Thursday morning. Whenever there was a work period, the concentration of chlorine gas leaking from the car went up. The Control Group had received a forecast from Malton that the winds were going to shift from the northwest to the southwest at approximately sunrise Thursday morning. It is a sign of the change in attitude at the Command Centre that it was determined that the Ministry of the Environment officials would take responsibility for ensuring that the CHLOREP team stopped work if the winds shifted; also, there would be a meeting of members of the Control Group at 05:00 Thursday, so evacuation procedures for the re-entry zones (those zones where people had already been allowed to return home) could be readied and implemented if required.

On Wednesday afternoon, arrangements were made by Mayor McCallion with CP Rail to move those remaining in Evacuation

Centres to hotels in Toronto and Oshawa at the company's expense. Evacuees were pre-registered, and taken by bus on Wednesday evening to the hotels. Unfortunately, this arrangement was made public, and many evacuees left the houses in which they were billeted, to return to the evacuation centres (primarily the International Centre) to get hotel accommodation. They were not permitted to go to hotels, but the International Centre was kept open until Friday to shelter these people and others who, running short of money, had to give up hotel accommodations.

The early Thursday morning meeting (05:00) was concerned, not so much about the concentration of chlorine ( $37 \text{ ug/m}^3$  were reported at 03:50 at Highway 10 and Fairview Road) but that residual amounts released by the work of the CHLOREP team might cause panic when smelled. It was decided to ask the Fire Department to spray water over the chlorine car, to form a curtain which would knock down substantial amounts of escaping gas. While setting up their apparatus - without wearing gas masks - eight firemen walked into a depression filled with chlorine, 65 metres from the chlorine car, and inhaled the fumes. They were sent to Queensway Hospital; seven were subsequently released, the eighth, John Engel, was kept under observation with suspected damage to his lung tissue.

## 2.6 THURSDAY

### 2.6.1. Draining the Tank

On this, the fifth day of the evacuation, displaced residents began to harass police and public officials so vehemently that Mississauga Mayor McCallion was forced to broadcast an appeal for cooperation from the evacuees. Six police "circulation teams" were at work at various perimeter points, deciding whether or not people had sufficient reason to be escorted in and out of the area. Hospitals in Metro and elsewhere that had accepted evacuated patients extended temporary privileges to Mississauga doctors. Four special medical centres for those whose doctors' offices were in the evacuated area were established at Apple Hills Medical Centre, Dixie Road



Medical Associates, Applewood Medical Associates and Streetsville Medical Centre. Apple Hills was set up as a mini-emergency service as long as Mississauga Hospital remained closed (see Section 4.2.3.).

The main Thursday meeting of the Control Group was the most technical of all the recorded meetings. The meeting began at 11:45, and primarily concerned the possibility of removing the remaining chlorine while assuring that there would be no more sudden releases (Section 3.5.1.).

The wind was blowing from the west; it was forecast to shift to the north at 22:00 Thursday, for a period of seven hours. After extensive discussion of the risks involved, it was decided to postpone the draining of the tank car until after 22:00 Thursday evening. It could then proceed, provided that no pumping began without the express authorisation of Tom Cross of MOE. A new emergency plan was set up by the police department and other agencies to rush out those people who had refused to evacuate or who had returned unofficially to the two-to-three kilometre danger zone around the site. The most worrisome area was the area south of the Queensway and east of Highway 10, where people had been allowed back in but which was perceived by the police and fire personnel as being too close to the danger zone.

The OPP brought up to 60 extra vehicles into the area; 303 police from all forces were put on alert and vehicles were stationed throughout the area as the hour to begin pumping approached.

At 22:00, the wind had not yet shifted to the north; nor had it shifted at 22:30. There was a further postponement until 23:00. It was then reported that one of the TAGA vehicles was inoperative. There was a further delay until 23:30, but the Fire Chief, who was concerned about his fire crews downwind of the scene, did not receive word of the postponement, and complained.

Finally, pumping operations began; and had no serious consequences. Negative reports were received from the monitoring units.

## 2.7 FRIDAY AND AFTERWARD

### 2.7.1. The Final Re-entry

Early Friday morning, November 16, it was believed that up to 10 tons of chlorine had been transferred as a result of the night's operations. Four tank cars of caustic soda were now being used to neutralize the chlorine. The wind had died down, and ambient readings were in the .002 ppm range, still above normal background level, but well below the discomfort level of .01 ppm.

A long Control Group meeting was held between 10:05 and 15:00 to determine the possibility of allowing full re-entry to the site. A gamma-ray detector had provided a rough estimate that two tons of liquid chlorine now remained in the car. A substantially increased number of backup vacuum lines had also been installed in the car, in addition to the working lines.

It was agreed that in light of the substantially decreased danger, the 25.8 square kilometre area south and west of the site (beyond the Credit River and the Queensway) would be declared safe. Police would be stationed downwind to alert those north of Burnhamthorpe, should any puff occur. At 14:55, an announcement was made allowing for the re-entry of approximately 40,000 evacuees to homes between the Credit River and Highway 10, and south of the Queen Elizabeth Way (see Figure 2.6). Approximately 30,000 evacuees were still barred from re-entry. It was also announced that the QEW would be opened for the Friday evening rush hour. Notes of caution were still sounded by officials worried about shifting winds. Police with loudhailers went through areas to which residents had returned advising people to close windows, in case of leakage during the transferral process. It was expected that there would be residual liquid remaining in the tank car following the pumping, but that the signal of almost complete elimination would be that the liquid line began draining vapour, meaning the level of liquid remaining was too low to be

sucked into the tanker truck. This occurred at 18:00. For the next hour and a half, MOE vehicles made a series of checks in the area for chlorine. The checks proved negative.

At 16:00, Van Volkenburgh of MOE had told reporters that 18 tons of chlorine had now been removed (revised from earlier estimates). Although 4,000 to 5,000 gallons of chlorine remained in the tank, it was the unanimous decision of all experts present that everyone could return home. Leaks of minute amounts would continue through the rest of the chlorine transfer, but monitoring would continue and Peel Regional Police and OPP would stand by in case of unusual developments in the last phase of the pumping.

At 19:42, Solicitor General McMurtry, flanked by McCallion, Burrows and Bentley, announced that all remaining residents could return home. People were asked to keep their windows open for 10 or 15 minutes upon their return, and they were advised by MOE officials that slight gas odors would linger for some time to come. At 21:00, the last of the evacuation centres, the International Centre, closed its doors.

With the return of residents to all areas, police and other agencies resumed normal activities. Peel Police patrols returned to regular service. Late Friday night, Metro Police, the OPP, and R.C.M.P. completed their support of the Peel Region Police. It was reported that between 45 and 50 break-ins had occurred during the week-long evacuation. On Friday, before the final announcement, one man was charged with assault and criminal negligence as he tried to run a police roadblock.

For the Ministry of the Environment, the end of the evacuation merely meant the continuation of their monitoring and sampling efforts, as well as an intensification of a program begun on Wednesday, which sent out teams to investigate residents' complaints about possible concentrations of chlorine. By Friday, 61 complaints had been checked, and a number of new complaints came in which were checked - with negative results - late in the evening. The TAGA units were now monitoring less than  $1 \text{ ug/m}^3$  of chlorine on Dundas Street. MOE also continued its water

sampling, especially a reported greenish-white discharge into the Credit River (which turned out to be from a water main breakage). Due to the immense amounts of water used, and the run-off of chemicals, the Wolfedale Creek drainage course had pH readings of 11 or more through the week, and high levels of toluene and styrene at the north of Wolfedale Creek, with lower levels recorded downstream in the Credit River.

#### 2.7.2. The Clean-up

On Saturday, approximately 30 cm. of liquid remained in the bottom of the tank car. Four of the Dow team returned to Sarnia. The last of the evacuees had returned from hotels. The Ontario Division Red Cross Command and Control closed down. The Media Centre was closed at 18:00. The immediate area around the site remained off limits, and fire and police personnel were still required to be present.

On Sunday, November 18, the final Control Group meeting was held. Considering the back-up of rail traffic, CP Rail had decided to put a "shoe-fly" track around the site, which caused the Control Group some concern about possible vibrations. It was decided to reduce the MOE contingent on-site from five persons to three, but MOE liaison with Dow would continue for the remaining period. The AES weather monitoring unit left the scene at 19:00 Sunday. The Red Cross left the site.

At 04:30 Monday, November 19, the chlorine car was finally emptied of liquid, but was still giving off vapour. On Monday, CP Rail opened its claim office, and St. John Ambulance set up a first aid post there. The tank car was filled with water in the morning, and was finally lifted onto a gondola car at 09:50 Tuesday morning and moved off to Sarnia, where it would remain until an inquiry into the derailment began. The Dow Chemical team returned to Sarnia the same morning.

On Wednesday, November 21, the Police Command Post was closed and the last piece of fire equipment left Mavis Road. Most of the Fire Department hose was ruined, and brass couplings

were corroded. Every vehicle was steam cleaned and washed at home stations.

Contaminated soil from the site was trucked away, beginning Friday, 23 November, to the Chinguacousy landfill site in the north of Peel Region, until protests from local residents forced a halt. After some delay, final disposal was arranged at a special landfill site in Mississauga.

On Tuesday, November 27, the Peel Region Mobile Command Trailer was removed from the site. All businesses were open along Mavis Road, and the CP Rail tracks were fully repaired.

On the 4th of December, 1979, the Privy Council of Canada, by Order-In-Council, set in motion the Mississauga Railway Accident Inquiry under the Honourable Mr. Justice Grange, Commissioner of the Supreme Court of Canada.



## **Chapter 3**

# **ORGANISATIONAL RESPONSE : DECISIONS AND RESPONSIBILITIES**





### 3.1 INTRODUCTION

The response of organisations to an emergency combines established structures and procedures with innovative actions to deal with new situations. For the purposes of this analysis, these continuous and complex interactions are divided into four phases:

- (a) Pre-Emergency Planning (before the derailment);
- (b) Emergency Response Tactics (the initial response);
- (c) Emergency Control Strategies (the longer-term management of the emergency);
- (d) Emergency Resolution (the elimination of the hazard).

Within each of the last three phases, certain decisions taken by the Control Group stand out as signifying points at which the course of the emergency was -- or could have been -- altered. At these points, debate was joined over the evaluation of risks; resources and personnel were canvassed; key people interacted, or left to make way for others; and new problems became part of the agenda.

Eight such "key" decisions are analysed here to examine how different agencies and individuals responded to the situation and to each other, and to identify, where possible, the factors that appeared to enter into the decision taken.

The eight decisions are:

- 1) The decision to evacuate populated areas near the site (Sunday, November 11);
- 2) The decision to evacuate Mississauga Hospital (Sunday, November 11);
- 3) The series of decisions to expand the boundaries (Sunday, November 11);
- 4) The reorganisation of the Emergency Operations Control Group (Monday, November 12);

- 5) The decision to allow some re-entry (Tuesday, November 13);
- 6) The evaluation of the CHLOREP team (Wednesday, November 14);
- 7) The decision to allow liquid pumping (Thursday, November 15);
- 8) The decision to allow final re-entry (Friday, November 16).

In general, the organisational response of the key agencies centred around the derailment site can be described as having begun with local, autonomous, immediate-response agencies that committed a sizeable fraction of their available resources to the event. The internal emergency management structure of these agencies sought to mobilize maximum resources and direct them toward the site, while maintaining a skeleton regular staff to handle normal affairs. Alerting senior internal personnel and calling on the assistance of "sister" organisations were the main priorities of the immediate response. In addition, particular emergency organisations with special expertise were called on for information and personnel. Early decisions were made on an improvisational basis, using little technical knowledge but relying heavily on the experience of senior people at the scene.

In the days that followed the initial response, the local autonomous agencies became part of an overall emergency control strategy built on the framework set up by the initial response. This new configuration reflected both the expanding size of the operation, and the need for political management of the situation. In addition to the immediate-response agencies, a new array of small--mostly managerial or expert--components or organisations came on-site. For these organisations, the response to the emergency was peripheral to their larger responsibilities so that it did not consume all

their efforts. The regional and national organisations, the chemical companies, and all the other members of this group, relied on their on-site representatives to ascertain what role the organisation should play in the continuing situation, and to represent the interests of that organisation.

For these and other reasons, the decisions made by the Control Group later in the week differ from the earlier decisions. In the later decisions, opinions from all sectors are weighed, technical information is vetted in substantial depth by the relevant available experts, competence is analysed, supervision of components--hitherto autonomous--is subjected to scrutiny and managerial control, unanimity is sought. Not only that, but the transmission and formulation of the decisions themselves are subjected to analysis. More and more time is taken up with assessing the command structure and the clearing up of jurisdictions and access to key personnel. The nature of risks and questions of perception of risks appear on the agendas of meetings. And by the end, it is possible to state (with all due respect to the strains and stresses on the official personnel) that the emergency itself had become more "routine".

### 3.2 PRE-EMERGENCY PLANNING

#### 3.2.1 Peel Region Emergency Planning

Essential to the success of the week's operations was the well designed, well defined, and substantially flexible emergency plan put into operation by Peel Region Police. This plan developed out of a number of problems, perceived needs, and events:

- (a) the problems of managing growth in Peel Region;
- (b) the provision of emergency planning in Ontario;
- (c) regional government requirements;
- (d) previous emergencies in the area

As one report on the derailment noted:

*When it was formed in 1974, Mississauga already included the Toronto International Airport (the busiest in Canada), a segment of the Queen Elizabeth Way (busiest highway in Canada), the second busiest port on the Canadian side of Lake Ontario, three oil refineries, a petroleum distribution terminal, and two major rail lines...*

(Hilbert et al, 1980)

These possible sources of hazard, combined with a spectacular population growth in Peel County (now Peel Region) had had a number of results, of which two are relevant to the organisational response. First, the proper management of burgeoning growth necessitated the creation of modern governmental structures, exemplified by the consolidation by the provincial government of towns, villages and municipalities - including Mississauga (itself a recent consolidation of towns and villages) into Peel Region in 1974. This regional government was based on the previous county system, but was now given the resources to engage in long-range planning. As a result, some of these resources were directed towards planning for emergencies. Second, emergencies in the area have multiplied along with the population.

Under the Regional Municipality of Peel Act, R.S.O. 1973, s.116:

- (1) *The Regional Council may pass by-laws,*
  - a) *for the establishment and maintenance of an emergency measures civil defence organisation in the Regional area; and*
  - b) *for providing moneys for emergency measures and civil defence, for the purpose of the emergency measures civil defence organisation and for the cost of operation of such organisation, and for other work in the Regional Area*

Using these powers, Peel Region drew up its master plan

in conjunction with the Police, municipal and volunteer agencies, to deal with situations

*abnormally affecting the lives and property of our society, requiring a controlled and co-ordinated response by a number of agencies, both governmental and private.*

(Peel, 1976 Section 1, part 1)

Above these agencies, a co-ordinating body, the regional Emergency Operations Control Group (EOCG), is given the mandate to take control in an emergency situation. In the Mississauga derailment, the Regional Emergency Plan was not put into effect, but the concept of the Emergency Operations Control Group was used. The Peel Region Police Disaster Plan takes the formation of an EOCG for granted when the necessity arises. Even if the Regional Emergency Plan had been put into effect, however, Peel Regional Police would probably have remained the lead agency, since the Chief of Police remains in control where police action or the investigation of criminal acts are involved. The Emergency Plan specifically states:

*Where the situation cannot be adequately dealt with under the existing division of statutory responsibilities the Regional Chairman may, at the request of the mayor of the affected Area Municipality, co-ordinate and control all services both of the Region of Peel and the Area Municipality required to deal with the emergency and provide such additional Regional services to such Area Municipality as may be required. However, where police action or investigation is required the responsibility and control in the area will remain with the Chief of Police or his designate and the police action will be co-ordinated with the other services.*

(Peel, 1976 Section 2, part 3)

The resources of regional government enabled the Peel Regional Police to live up to their responsibilities by allowing the re-assignment of senior police personnel to emergency planning on a full time basis. Failure to put the Regional Emergency

Plan into effect did have some complicating effects, discussed below in Section 3.3.2.

### 3.2.2. Peel Regional Police Disaster Plan

As befits an organisation with immediate emergency responsibilities and frequent exercise of those responsibilities, the Police Disaster Plan is flexible, based on previous experience, and thought out in depth. It provides a framework within which all other local agencies can work during an emergency; and yet it can also expand to implement the Emergency Operations Control Group and to include other levels of government.

Peel Regional Police began planning for large-scale emergencies following a natural gas explosion in 1969 which flattened a community in Mississauga, resulting in one death, and the evacuation of 200 people from the area. The death of 108 people in the next year's air crash in Woodbridge near Malton airport underscored the need for the integrated responses of ambulance Red Cross, regional and provincial police to events of this magnitude. With hindsight, one can see that subsequent emergencies highlighted necessary elements in the creation of a workable plan. In 1975, a gunplay incident at a local school in which four people died, forced Peel Police to come to terms with massive media coverage, resulting in subsequent emphasis on managed media centres and having senior officers trained in communication skills. Another air crash at Malton, this time in 1978, required the co-operation and co-ordination of emergency ambulance teams, volunteer agencies, Federal Transport officials, and others. The Texaco oil refinery fire, also in 1978, provided a full-scale "rehearsal" for the derailment. In this incident, over 1,000 people were evacuated from their homes by police, including the residents of a home for the aged. In addition, the Texaco fire tested the co-ordination of police,



fire departments and other agencies, in both using and acquiring personnel and resources. The Mississauga Branch of the Red Cross, for instance, received valuable experience in setting up evacuation and registration facilities.

As a result of these events, the emergency plan is detailed, tested, and known by both senior and junior officers. Major elements in the plan are:

- (a) control at the scene is under the direction of a designated on-scene commander. This person, usually the superintendent from the affected division will be responsible for all police operations related to the incident;
- (b) to make command and control possible, the on-scene commander works from a command post at the scene, and keeps in open-line contact with Peel's dispatch centre. The command post can either be a place taken over for the incident, or the Force's own mobile command trailer (MCT);
- (c) the plan sets out a procedure for notifying senior officers, and other agencies as the need arises;
- (d) a special location is to be established as a media relations centre; and a senior officer is to be assigned to the media.

(Scanlon, 1980)

At the scene itself, the police follow a conceptual framework which is in operation in many other police forces across the province, including the Metropolitan Toronto Police. The object is the isolation--if possible--of the emergency area behind a cordon. At the edge of this cordon, or as close to it as is prudent, the police situate their Command Post which serves as the nucleus of the response operations. Between the first, isolating cordon, and the outside world, is a second cordon within which the emergency response agencies move and operate. Often using the Police Command Post as communications centre, all emergency agencies are controlled (by access, if by no other method) and monitored in this corridor. Inside this corridor

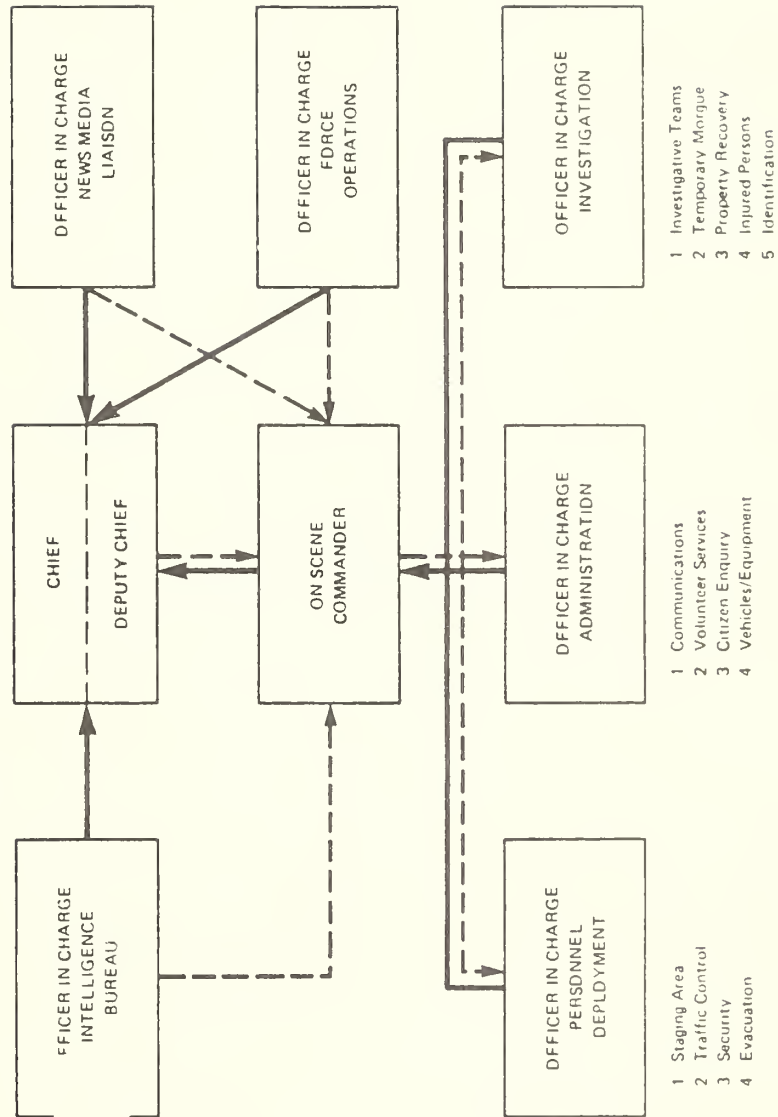
can also be found the Media Centre for the press. Beyond this second cordon, a series of wider and wider cordons (or evacuation areas) can be initiated, radiating away from the site of the emergency.

It can readily be seen from this description that there is an organic flexibility about this cordoning and command post system. In the event that more and more senior levels of government arrive on the scene, the command structure of the police can be altered to match that expansion. The police operate on the principle that the on-scene commander remains in charge of on-scene operations no matter how senior the officers who subsequently arrive may be. The more senior officers act as support, or are assigned to other activities in the expanding situation. In this way, the Chief of Police, for instance, is in overall command on and off scene, but is free to co-ordinate police activities with those of other agencies at the highest levels (see Figure 3.1).

In general, the police consider themselves to be in charge of the emergency incidents for which their plan is put into effect. The introduction of other agencies does not alter that, and - as in Mississauga - even with the creation of an Emergency Operations Control Group and a "think tank" and the incorporation of provincial agencies, the police consider that they are ultimately responsible for the public safety and security in the emergency zone. This is in line with the policy of the Government of Ontario, which at present serves as a support or augment to the first line of defence, the municipality or region in which the disaster takes place. In this case, the strong police involvement facilitated the assumption of overall authority by the Solicitor General, who is himself the senior law enforcement officer in the province.

In order to understand the involvement of the Solicitor General and ministries of the government of Ontario in the

FIGURE 3.1 THE EMERGENCY COMMAND STRUCTURE  
PEEL REGIONAL POLICE



emergency, it is necessary to put the Police Disaster Plan and the Peel Region emergency planning effort in the context of emergency planning and response in the Province of Ontario as a whole.

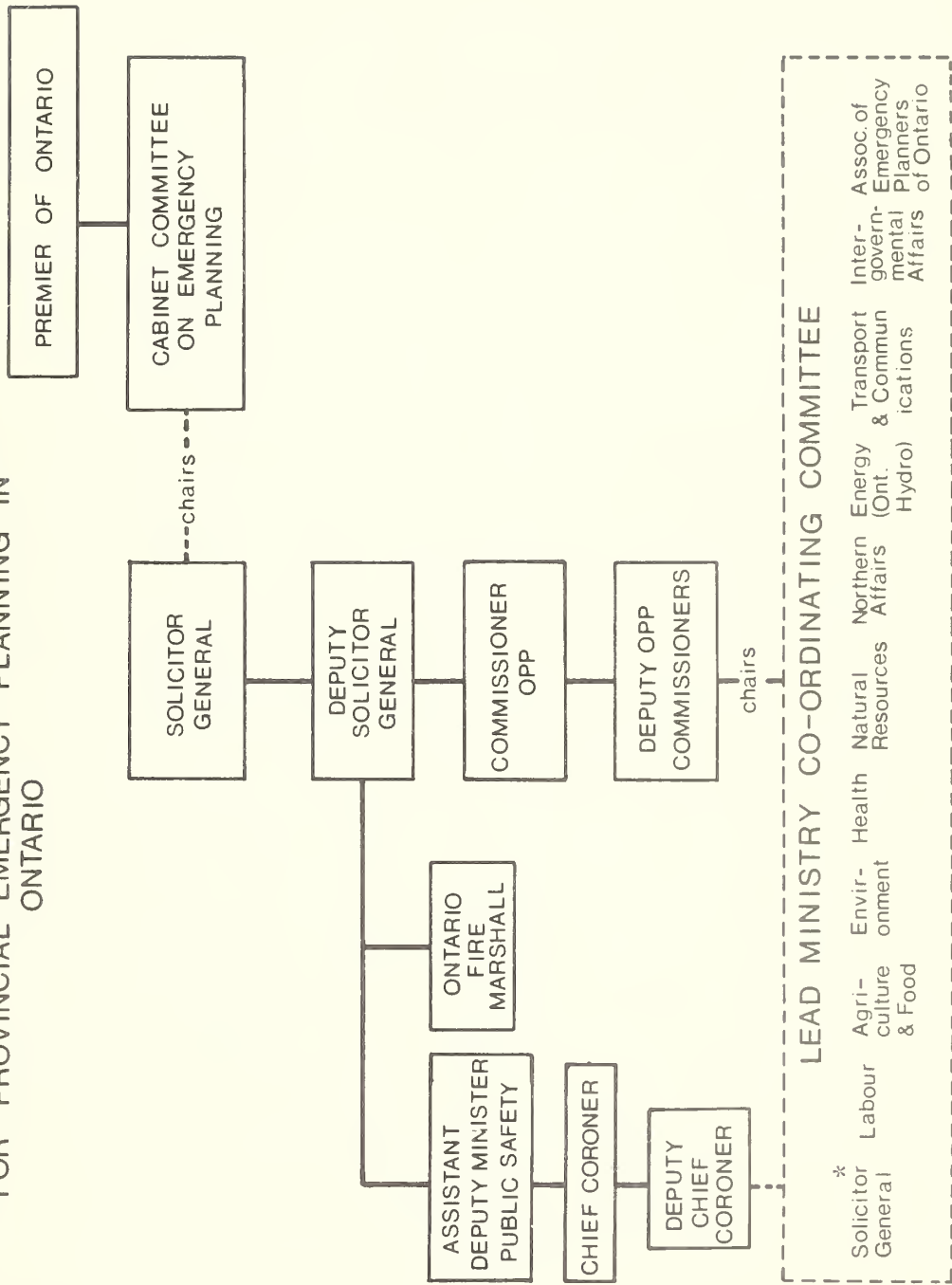
### 3.2.3. Provincial Emergency Planning

In Ontario, provincial emergency planning has generally been structured around a "lead ministry" concept (as outlined in Orders-in-Council 1484/75, 1487/75 and 178/79). The "lead ministry" structure provides that in the case of an emergency beyond the capacity of private, local or municipal agencies, a ministry of the provincial government, either specially competent or previously designated to handle the particular type of emergency, will become the lead agency; that is, it becomes the co-ordinating and controlling body of any provincial response to the emergency. This may entail the use of its own resources, or any other resources it may be disposed to call upon from other ministries. This designation is jurisdictional, not statutory.

Designated ministries and their special areas of responsibility (as of January, 1979) are:

<u>Ministry</u>	<u>Event</u>
Energy	Energy supply matters
Environment	Spills of chemicals, oil or other contaminants or toxic agents; gas or oil pipeline break
Health	Epidemic
Intergovernmental Affairs	Funding and co-ordination of extraordinary provincial expenditures on emergencies
Labour	Nuclear reactor accident with off-site effects; heavy water accidents with off-site effects
Natural Resources	Flood; forest fire
Solicitor General	Major air crash; snow emergency; other peacetime emergencies; war emergency

FIGURE 3.2 SENIOR POLICY MAKING STRUCTURE  
FOR PROVINCIAL EMERGENCY PLANNING IN  
ONTARIO



\*Note addition of Emergency Planning Co-ordinator to Solicitor-General's office (1980)

In addition, though not by Order-in-Council, the Ministry of Northern Affairs has been given a co-ordinating role for emergencies in Northern Ontario, involving a response by more than one provincial ministry, and the Ministry of Agriculture and Food takes a lead role in cases of crop disaster and drought.

The present policy-making structure depends on the Emergency Planning Committee of Cabinet, which steers (through the Ministry of the Solicitor General) the Lead Ministry Co-ordinating Committee, made up of planning personnel and other interested parties from the relevant ministries. (See Figure 3.2) There has recently been set up an Emergency Planning Co-ordinator in the Ministry of the Solicitor General.

The policy-making structure is embedded in the Ministry of the Solicitor General, partly because of the Solicitor General's overriding responsibility for public safety, and partly because some of the initial emergency response agencies are within the Solicitor General's Ministry. The communication structure is presumed to function as follows: a municipal official (or possibly a private citizen) who feels that provincial assistance may be required (usually when municipal resources have first been utilised), contacts the nearest detachment of the OPP. They in turn relay the information to OPP Headquarters, where established procedures enable them to pass the communication to a contact person in the appropriate lead ministry. In some cases, the OPP detachment may get in touch directly with the field offices of the ministry. In the case of Mississauga, it appears that all of these functions of the OPP alert system were carried out.

The Federal government is only involved in those contingencies that entail inter-provincial jurisdictions, specially designated for emergency responses, such as radiation accidents, or disasters large enough to require military intervention or an extremely large expenditure of funds (over \$1 per head of provincial population). In many provinces, however, the Federal government has an emergency planning function,

overseen by Emergency Planning Canada, specifically geared to supporting municipal emergency planning. In Ontario, before the lead ministry concept came into being, a joint federal-provincial organisation called the Emergency Measures Organisation (EMO) was the basis of the municipal planning effort. Federal funding now supports the Emergency Planning Officers in those municipalities that retain the old EMO system. (Timmerman, 1980)

There is no municipal-provincial joint planning in Ontario at present, except for planning for specific contingencies such as the evacuation of the Pickering nuclear power plant area following a nuclear accident. Nevertheless, many of the existing municipal plans and by-laws offer guidance and incorporate previous planning efforts into the governing structure. Legislation is now being considered to remedy the obvious gaps in this part of the overall emergency planning effort.

#### 3.2.4. Industry Emergency Planning: TEAP and CHLOREP

Of particular relevance to the Mississauga emergency is the emergency planning carried out on a voluntary basis by private industry, specifically the Canadian chemical industry. The Transportation Emergency Assistance Plan (TEAP) is a 24-hour-a-day, 7 days-a-week emergency telephone communications network run by the Canadian Chemical Producers' Association from Regional Control Centres (RCC), staffed by member chemical companies. This is equivalent to the CHEMTREC system in the U.S.A. The caller can receive standard technical advice immediately from a Technical Adviser who may then communicate with the manufacturer or shipper of the chemical involved. In the case of chlorine accidents, a further industry resource involves CHLOREP, a plan which designates emergency response teams from industries with chlorine-related expertise in sectors dividing up North America. (See Section 2.2.9.) The teams of two or more specialists can be dispatched to provide on-site



assistance in the event of a chlorine spill. This is a voluntary program, and has only been recognised as an appropriate role by the industry itself in the last 15 years.

### 3.2.5 Volunteer Emergency Planning and Provision of Social Services

Other elements in the emergency planning effort are the volunteer and other agencies providing assistance for social needs during emergencies. Much of the impact of the week's events fell on their shoulders; their planning and response are described in Chapter 4.

## 3.3 EMERGENCY RESPONSE TACTICS

### 3.3.1. The Implementation of the Immediate Response Plans

As outlined in the event reconstruction, the immediate emergency plans of the Police, Fire and Ambulance services were implemented within seconds of the derailment, due to the spectacular nature of the accident. In each case, the first concern was the mobilisation of as many personnel and as much ready equipment as possible, even before the specific characteristics of the emergency were fully clarified. The second concern was the alert of more senior personnel, coupled with the commencement of a fan-out procedure linked to the central communications office of each agency. The evidence indicates that this second alerting procedure - in the case of Police and Fire Department - was a combination of official emergency procedures and internal judgements as to personnel priorities within each agency. As the size of the expected response grew, the fan-out became less of a specific alert, and more of a general call-up of all available resources.

Each initially responding agency was thus:

- (a) mobilising all available personnel and resources;

- (b) communicating internally, and to a limited extent with officially designated external agencies;
- (c) setting up a rudimentary command structure.

The seriousness of the situation was immediately apparent to the Peel Regional Police, and within minutes senior officers had put the Disaster Plan into effect. After an initial assessment of the problem, much of the constables' and officers' work was confined to the preliminary establishment of a cordon around the area, through the direction of traffic and the evacuation of skeleton crews on Mavis Road. (See Sections 2.2.3. and 2.2.4) The police log (another requirement of the Disaster Plan), shows that the rudiments of the command structure were in place within half an hour of the derailment, including the first establishment of a designated command post. If there is one failure of the response at this point, it is in the lack of a fan-out procedure that included the Mayor of Mississauga and the Chairman of Peel Region. Although Chief of Police himself had requested that they be contacted, (there is no formal requirement) the Mayor herself telephoned one hour later, and the Regional Chairman was not notified until four to five hours after the derailment. It is clear that Police gave priority to alerting their own people.

The Fire Chief, Gordon Bentley, has himself outlined one of the main problems of a massive early call-up:

*If you yield to the temptation to use all these men...or keep them standing by in reserve, this can create a problem at shift change when you need a fresh complement of fresh men at the fire scene and to run the fire halls. In other words, if a chief yields to the natural temptation to pour in everything he's got for a massive first strike, rather than think ahead eight or ten hours, he runs the risk of fatigue setting in to his whole department at the same time.*

(Oughton, 1980)

Indeed, one of the lessons of Mississauga for every agency was the need to foresee the possibility of the emergency's lasting more than 24 hours. The other temptation is for the Chief to become a fire-fighter. In both the Police and Fire Departments, the division was made between the on-scene commander and the

overall commander. In the Fire Chief's case, for instance, his time at Headquarters was taken up with inter-departmental co-ordination, locating extra equipment, assigning special duties, organising the "covering" of fire stations by Fire Departments on the fringe of the municipality, and handling the media that converged on his station.

The main characteristic of the second part of the immediate response (that is, that period before the first official evacuation) was the need for increased specificity about the nature of the hazard being faced by the response agencies. Due to the circumstances of the derailment, this took some time to achieve; in addition to managing the men and resources encircling the derailment site, the senior officials of the immediate response agencies on-scene began to try to find out the probable outlines of the entire problem. At his Headquarters, the Fire Chief demanded a copy of the train manifest from CP Rail; at the Command Post, the Police and on-scene Fire Department personnel tried to decipher the smudged manifest in their hands. The resolution of that issue altered the fan-out procedure: in particular, the initial alert of propane companies in the area by the Fire Chief shifted to the alert of TEAP and subsequently the Dow Chemical CHLOREP team in Sarnia (alerted by CP Rail from London).

In the same way, the fan-out procedure had now progressed to the point where emergency groups of larger regional and provincial agencies were alerted. First, the standard emergency numbers were contacted, and the specific group in the organisation with emergency capability responded. In general, this means that senior levels of these peripheral (in the strictly logical sense) groups were not contacted until much later in the morning. There was no automatic progression up hierarchies: the magnitude of the alert followed the perception of the growing magnitude of the response required.

The 1978 Texaco fire had forged strong links between the Police Department and the Red Cross, and it was likely this rapport, rather than a careful following of the Peel Police plan that resulted in the alert of the Red Cross within half an hour of the derailment, well before evacuation of residential areas was being considered (See Section 2.2.7). Nevertheless, this marks the onset of a complicated relationship between the evacuations and the Evacuation Centres which required skilful management, most obviously because many Evacuation Centres had to be opened prior to any influx of evacuees. Clear confidence that this could and would be done by the Red Cross and other agencies without Police supervision was obviously a strong element in the speed with which the first evacuations were decided upon.

The swift implementation of the Police Disaster Plan meant that jurisdictional questions were sorted out very early on: Police Chief Burrows and Fire Chief Bentley confirmed their respective duties, and Burrows took overall command of the emergency. (See Section 2.2.5.)

### 3.3.2 The Decision to Evacuate Populated Areas Near the Site

The first decision Chief Burrows made was to evacuate homes to the southwest of the site (the direction the wind was blowing at that time). There had already been a clearing of factories north and south of the site, and all official personnel were themselves ordered back at least 600 metres. This was in response to the advice of the Fire Chief and the CP Rail Police who were concerned about the 19 cars of propane and other explosive material that could be expected to explode. There are reports of police knocking on doors in the nearby residential area, advising of the propane danger, well before the official evacuation began.

The key to the evacuation decision, however, was the confirmation of the possibility that a chlorine car was in the burning portion of the derailed train. Chief Burrows was dissatisfied with the assertion (based on the manifest copy) that the chlorine car was not in the wreck. He ordered teams to do a car by car check of the tankers and report back to the Command Post. According to the police transcripts, at 01:38, the danger was reported as shifting from explosives to "volatile, corrosive and highly flammable substances" (See Section 2.2.5.). The perception of the emergency had moved into a new phase based on the probable location of the car. As Burrows also noted in an interview, there was a mixture of chemical smells now present, one of which he thought was chlorine. He said that for the first few hours, one could see the plume of smoke heading downwind from the blaze.

*"You didn't need environment officials or balloons to tell you that."*

Burrows and his Duty Inspector, Jim Kimber, canvassed the available expertise, which included the Fire Chief, CP Railway Police, C-I-L Chemical Engineers, and a Ministry of the Environment representative who had just arrived at the Domtar plant Command Post. Available information on chlorine was also obtained from the Fire Department standard emergency documents outlining the dangers of hazardous chemicals, the advice of CANUTEC (part of the Information and Emergency Centre of Transport Canada's Hazardous Goods Branch) and the TEAP Technical Advisor.

Ultimately, however, the first decision to evacuate was made on the basis of the police chief's assessment of the danger from chlorine gas, based on:

- (a) the smell of chemical fumes;
- (b) the fact that evacuation area 1 was the closest to the site (See Figure 2.5):
- (c) the fact that the winds were blowing to the west at the time.

At 01:47, Chief Burrows ordered the first official evacuation west of Wolfedale Railway tracks - Mavis Road to Dundas - Erindale Station Road - under the direction of Inspector Kimber and Staff Sergeant Crowell. This was approximately 2 hours after the derailment. The chemical smells and the plume of smoke drifting downwind helped speed the evacuation.

### 3.3.3. The Transition to the Control Group

It is impossible to mark any one point in the immediate response when the need for "political" response developed out of the emergency situation. One key event, however, was the second stage of the evacuation (04:15), which implied that further evacuation stages were merely a matter of time. In addition, the descent of the chlorine cloud made the nature of the hazard more obvious to all participants, and some began to suffer minor symptoms. A review of the chronologies of the various agencies reveals that at about this time, in almost every case, the communications links were alerting police commissioners, senior management and deputy ministers. In the OPP, the Ministry of the Environment, and in Peel Region itself, there was a manifest sense that - after 4 hours - the possible repercussions of the derailment needed greater resources and input from senior management.

As mentioned above (Section 3.2.2.), the main communications network in the Province of Ontario ministry response is through the OPP which is mandated to alert other ministries as needed, and its own senior officials. In the case of Mississauga, the OPP fulfilled that mandate, since not only did they alert the OPP Commissioner who in turn appears to have contacted the Deputy Minister (Solicitor General), but they also alerted the senior levels of the Ministry of the Environment (MOE). Since from the reports one can conclude that Regional MOE officers on-scene (including duty personnel



manning the telephones) did not alert their own provincial people, the OPP network proves to have been a good back-up system in a way probably not envisioned when the procedure was set up.

In the Peel Region itself, the calling up of the Emergency Operations Control Group occurred at the same time, with Mayor McCallion and Chairman Bean being directed to the site. The detailed description of the relationship between the Police Plan and the Peel Region Emergency Plan suggests the strong police lead agency role in both plans. Because the police were already playing the lead agency role in the derailment, it does not seem to have entered the minds of the participants in the first meeting of the group to ask for official endorsement of the Police plan, nor indeed for the superseding of that plan by the Peel Region Emergency Plan, which would, presumably, have resulted in the overall command of the emergency being assumed by the Chairman of Peel Region. The Chairman has himself noted that the Region would only take charge following a request from the mayor of a local municipality.

The lack of implementation of the Peel Region Emergency Plan did have one or two unforeseen consequences, revolving about the role of Peel Region Social Services. First of all, Social Services was not alerted until quite late by the Police (see 2.27). Secondly, Social Services had carried out a series of surveys of acceptable evacuation sites in the area, which would have been extremely useful in the elimination of places such as the International Centre in Malton from consideration. Thirdly, if the Plan had been implemented, Social Services would have had the power to open and run the evacuation centres themselves, a power which would have solved some of the problems in the early manning of centres.

The other major immediate emergency response during this period was taking place 350 kilometres away from Mississauga in Sarnia. Following notification of the derailment by the CP Chief



Train Dispatcher in London at 01:49, Dow's Emergency Co-ordinator put together a CHLOREP team by 03:15, consisting of two chlorine experts, one fire expert, and a public relations advisor (See Section 2.2.9.). Communications between Dow's Co-ordinator, CP Rail, the Mississauga Fire Department and Cyanamid RCC (the TEAP centre for Mississauga) confirmed the site of the derailment, the probable cars and their contents, and possible emergency response routes. The team left in an emergency vehicle with small patching tools and protective equipment at 03:30, arriving at 06:30 hours.

The team confirmed both the actions that had been taken so far and the existence of the chlorine car in the derailed section of the train. It was also confirmed that the car was leaking. They were then incorporated into the first meeting of the Control Group held at 07:30, to decide whether Mississauga Hospital should be evacuated.

#### 3.3.4. The Decision to Evacuate Mississauga Hospital

This decision was perceived by most of the participants in the decision-making process as a watershed. The feeling was that it was now theoretically possible that more people could possibly be harmed by the evacuation than by the hazard of the derailment. Before the crucial meeting to determine if the proposed evacuation should go ahead, Chief Burrows had contacted the President of the hospital, Merit Henderson, by telephone at 07:25. According to the report of the hospital staff in the evacuation, the Police Chief indicated that there was a problem with chlorine gas and the continuing propane burn. The President was reluctant to move the seriously ill patients; however, he indicated

*"the hospital would comply with an evacuation order since the Police Chief had a better understanding of the danger from his vantage point at the scene of the crash".*

(Mississauga Hospital, 1980)

Ambulances would be moved into the area, and a formal call would be made by the Police Chief when the decision was made.

Burrows, Fire Chief Bentley - who came on scene for the meeting - Mayor McCallion and Chairman Bean were among those present, as well as the recently-arrived Dow experts. There was an updated weather report from Malton Airport, suggesting that winds would be - 6 km/hr from the north. That was the most accurate technical information available. "Back of the envelope" calculations were the norm until substantially later in the day. Stu Greenwood of Dow Chemical, after conferring with the Chlor-Alkali Unit Manager in Sarnia, recommended an evacuation of the hospital, as did the rest of the participants. Once again, the final decision appears to have rested with the Police Chief, based on the knowledge and advice of the available key actors.

When the stand-by alert to Mississauga General and the adjacent Chelsea Park and Extendicare nursing homes had come (at 06:50), the Ambulance Services Branch of the Ministry of Health in conjunction with the Halton-Mississauga District Ambulance Service and Metro Toronto Department of Ambulance Services assumed responsibility for:

- (a) canvassing region hospitals for available space;
- (b) helping to set priorities on patients;
- (c) marshalling all available ambulance units.

This was backed up by an additional province-wide system of ambulance services, using the provincial ambulance co-ordination centre at Oak Ridges to marshall and organize a large-scale response in major emergencies.

Chief Burrows has stated that he had had experience with the ambulance services at the recent air crash at the International Airport in June 1978, and he had confidence in their ability to get large numbers of ambulances to the scene. Without that confidence, he said, the decision would have been a great deal more difficult.

As it was, there was recognition of the difficulty involved:

*"For instance, your lead time at the hospital; it will take six to eight hours to clear. It's never been done before. You have to commit yourself an hour ahead of time, at least, as lead time. The lead time is to get the ambulances up."*

(Inspector MacDonald cited in  
The Globe and Mail, November 17, 1979)

Ambulance Services began canvassing for ambulances from as far away as Kingston. By 08:30, 50 ambulances had arrived at the hospital, awaiting the evacuation order.

### 3.3.5 Evacuating Mississauga Hospital and Nursing Homes

The evacuation of Mississauga Hospital and adjacent nursing homes (which proceeded through the rest of Sunday morning) was a model for the further evacuations of other hospitals and nursing homes later in the day. Its success suggested that the expected eight hour time requirement for such an evacuation could be cut in half if enough personnel and ambulances were available.

Three agencies were primarily responsible for the evacuation: Peel Police, the Ambulance Services Branch (of MOH) and the staff of the Hospital and nursing homes. There was no emergency plan for evacuating a hospital in any of these three groups, so the response was a hybrid of the emergency plans that were available. In particular, Ambulance Services had procedures for moving seriously-ill patients from one hospital to another, and they also had procedures for dealing with mass emergencies. In the event, the "sending" hospitals were treated as if they were point sources for mass emergencies; while the "receiving" hospitals treated the incoming by modifying emergency procedures for treating great numbers of casualties.

Fifty ambulances were at Mississauga Hospital by 08:30, when the hospital evacuation was scheduled to start. Ambulance Services was also charged with locating and assigning spaces for patients in the hospitals that were to receive them; with

organising the travel routes; and with the loading and unloading of ambulances.

Inside the Hospital, discharges were given to some patients, and supervisors went floor by floor assessing the state of patients, giving priority to intensive care patients. Some patients were discharged at the Day Surgery entrance, while ambulance pick-up was scheduled for the Emergency Department. The evacuation proceeded (after intensive care patients were moved) from the ground floor up. Complete medical records were taken with each patient. The ambulances were directed by joint communications from the Halton-Mississauga Ambulance Service and the Hospital Associate Director of Nursing.

The Police, who installed a communications unit in the Hospital, were responsible for clearing traffic routes and for overall control. Altogether, 537 patients and senior citizens from the nursing homes were moved, 186 from hospital to hospital.

Subsequent evaluations have suggested that the four hour evacuation time could have been reduced by having two patients per ambulance and by calling in many more vehicles. Had there been a substantial number of casualties from the derailment, however, the evacuation could not have proceeded so smoothly.

#### 3.3.6. Expanding the Response

By the time of the series of early-morning evacuations and the evacuation of Mississauga Hospital, the Police Command Post operations had moved to the permanent site at the Bell Centre north of the site. The fire was stabilised; MOE water and air sampling teams were in the area. The major problems for the organisational response on-site were the management of concurrent evacuations (residents and hospitals), and the incorporation of more and more elements of outside agencies into the command structure.

Management of the first problem required dependence on the ability of volunteer agencies to open and man new evacuation centres, and on the interlocking of various police forces (now approaching 500 officers and constables) in a pattern of independence within the Police Disaster Plan - exemplified by the policy of not assimilating other forces to Peel Police units. It also depended, as Chief Burrows has said, on the confidence he had in the ability of Ambulance Services to fulfill its part of the Hospital evacuation.

The second problem, incorporating outside elements, had two aspects: one, the transfer of authority; and two, the provision of priority information. It appears that the news of the derailment passed through OPP Commissioner Harold Graham, who was awakened at 04:30 and called Deputy Minister John Hilton. Solicitor General Roy McMurtry was informed of the derailment between 06:00 and 07:00. He has since commented that the system should have relayed the information to him somewhat sooner. It is uncertain whether there was a consultation with any other Cabinet colleagues or the Premier before McMurtry proceeded to the scene, arriving at 09:28.

The alert of Ministry of the Environment officials proceeded in a different manner, most obviously because, in the case of the Solicitor General's office, a vast array of police personnel and equipment was already in action before senior provincial officials were required. In MOE's case, the environment representatives on-scene were only gradually compelled by circumstances to move from an advisory role to a full-scale technical sampling and monitoring effort. Ron Graham and John Barr (Oakville office) were the regional representatives already on scene, with an MOE Duty Officer (P. Roussel) and Mr. Bartkiw, the District Officer for Peel and Halton, as the telephone contacts. The telephone contacts had been taking reports from the on-scene representatives through the night, and also fielding questions from the public.

MOE's Air Resources Branch became alerted partly because of a rumour about the presence of PCB's in the wrecked tank cars. Dr. E. Singer, a unit head at MOE, was up early to go fishing and read about the derailment and possible PCB's in the Sunday Sun. He telephoned Gregg Van Volkenburgh of the Monitoring Unit, Air Resources Branch, at 06:45 a.m. Slightly earlier, Tom Cross, the Director of the Branch, was telephoned by the executive assistant to the Deputy Minister about the possibility of marshalling monitoring equipment.

It seems that someone in the Solicitor General's Department contacted the Deputy Minister. The Regional MOE Office did not pass the alert to the provincial office. Cross then telephoned Van Volkenburgh to discuss the appropriate response to the emergency, involving the deployment of Trace Atmospheric Gas Analyzer (TAGA) vehicles (Section 2.2.12). Organizing the TAGA crews took until 10:00 Sunday. Cross meanwhile contacted officials of MOE's Contingency Planning Section, and Dr. Max Fitch of the Ministry of Labour's Special Studies and Services Branch.

Tom Cross and Dr. Fitch both remained at their homes for most of Sunday. The on-scene senior MOE personnel were Garnett Kay of the Contingency Planning Section and George Trewin of Central Region, (arrived 09:45), both of whom considered themselves as support for the regional people and as advisors to the overall effort. Graham, Barr and P. G. Belling from the Contingency Planning Section conducted water quality samplings in Wolfedale Creek and in the Mavis Road ditch (08:00-10:00). Other MOE sectors becoming involved included the Meteorological Services who were called in for their forecast capability, and the Industrial Abatement Section.

For the Ministry of Health, alerts proceeded through the dispatch centres of the various ambulance services, and primarily focused on the initial response, and the evacuation of the hospitals. Senior MOH officials were alerted by Dr. MacBride, the Principal



Program Advisor of the Emergency Health Services. He was given authority to do what was necessary from the Ministry perspectives by the Deputy Minister. MacBride was involved in the early Sunday afternoon meetings on-site and in Oakville. One of his functions there was assisting in setting up an emergency medical section on-site for the officials and workers. This was done through the Ontario Medical Association, and Dr. Galliver of St. Joseph's Hospital, Toronto.

In the case of most of the organisations that now sent representatives to the scene, there was a need to have a liaison with the Command Post and someone in charge of the response - occasionally they were the same person. For a key group such as the Ministry of the Environment, the configuration became:

- (a) Regional MOE staff on-scene sampling;
- (b) Central Region staff for liaison with MOE provincially;
- (c) Contingency Planning Section representatives;
- (d) Subsections of MOE fulfilling technical functions (eg. Air Resources Branch sampling and modelling);
- (e) Minister and Deputy Minister at EOCG meeting;
- (f) Media liaison.

As the emergency progressed, most agencies (like MOE) sought a balance between looking inward to the Control Group and looking outward to their own responsibilities.

For all of these reasons, it was inevitable that a proto-cabinet with representatives of each working agency would be formed, to sort out priorities and control the myriad operations being undertaken. In this instance, Solicitor-General Roy McMurtry (in charge of the lead Ministry) very swiftly supported the police command structure already in place, and moved toward a more structured management system. McMurtry's arrival initiated a new series of meetings that were to last for the rest of the day. McMurtry became the chairman of the Control Group, and, although he could be considered as the ultimate authority on scene, he tried to leave the impression that he was merely first among equals, canvassing



all opinions and, requiring cabinet-style unanimity for decisions taken by the group. In retrospect, these numerous Sunday meetings were part of the slow evolution toward the stabilisation of organisational response.

3.3.7. The series of decisions to expand the boundaries of the evacuated area.

The process of decision-making during the rest of Sunday was based on:

- (a) the control of the outflow of evacuees;
- (b) the appropriate boundaries for evacuation;
- (c) wind shifts and, later in the day, technical modelling.

Decisions were made by the Control Group, chaired by the Solicitor General.<sup>1</sup>

The first evacuation orders were smaller than those which began after daybreak. Times and estimated numbers of evacuees indicate that the police felt they could move 20,000 people every hour if necessary. The procedure was based on setting evacuation zones based on recognisable street or geographic boundaries, and preparing areas not yet evacuated in advance of alert. Three factors made decisions easier:

- (a) successful evacuation of some areas had already been carried out, and officers were now well rehearsed in the techniques of mapping and evacuating an area;
- (b) the available police personnel had been supplemented so that operating strength was now over 500;
- (c) as people awoke on Sunday morning, the public media began to play a substantial role in broadcasting advisories.

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<sup>1</sup> The chronology of the numerous evacuation decisions throughout the rest of Sunday is provided in Sections 2.2.14 and 2.2.17; a map of the evacuation zones is provided in Figure 2.5; and a list of the times at which evacuation decisions were made on Sunday, and the numbers of people involved, in Table 4.4.

As mentioned (Section 2.2.16), environmental monitoring and modelling were at a rudimentary level until the middle of Sunday afternoon, so that decisions were based on the same environmental criteria as were in force earlier. Since the direction of the plume was the most concentrated area of serious hazard outside the site, changes in wind direction were critical at varying decision times. Square One Shopping Centre, for instance, at risk if the wind shifted, had to be closed, and the evacuees sent to other Evacuation Centres.

During this period, there was a slow increase in the amount of information available on which to base decisions. By the time Queensway Hospital was ordered evacuated at 15:40, decisions began to be made on the basis of expert modelling. Certainly, the reports of the meetings held between hospital officials and the Control Group emphasised the possibility of a serious explosion on site giving only 15 to 20 minutes of evacuation time.

The components of this modelling process dovetailed as follows. The TAGA 2000 and 3000 units arrived on scene at approximately 12:30, and were immediately sent downwind to survey the plume. At 14:47, the first results from the Sciex TAGA were reported by radio (one delay to the start of monitoring had been the inadequacy of the radios in the trucks: portable units had to be added). An instantaneous reading of  $100 \text{ ug/m}^3$  of chlorine was recorded at Dundas Street and Mavis Road. This can be compared with the official acceptable chlorine concentration of  $30 \text{ ug/m}^3$  over a half hour period. This information was relayed to George Trewin, the MOE Command Post Liaison at the time. Meteorological information was provided by a joint working team at Malton Airport, made up from the meteorological section of MOE's Air Resources Branch and the federal Atmospheric Environment Service (AES), Ontario Weather Centre (each of which added more personnel to their standard complement).

The first request for special weather predictions came to AES at noon Sunday, but the Canadian Meteorological Centre (CMC) in Montreal had heard the news of the derailment and was already

at work plotting a wind trajectory. The first projections were received at about 13:15. The CMC model was based on predicting movements of pockets of air for purposes of air pollution transport modelling, and was not suited to modelling releases from a fire, or from an initial high trajectory. In addition, weather forecasts were only available twice a day - midnight and noon - with a falling off in accuracy in between. The other available modelling unit was the Dow Chemical computer in Midland, Michigan, which also provided plume models.

At this time (13:00 - 15:00), the winds were from the north-northeast at 20-25 km/hour, and were expected to drop to less than 10 km/hour as the day progressed. Consultations between Trewin (MOE), Dr. Fitch (MOL), Dr. Cherkas (MOH) and others failed to confirm a safe, short-term maximum ambient level for chlorine. Different levels were used in the computer projections: MOE used 3 ppm; Dow used 1 ppm. MOE calculations (by J. Wieder) showed that 30 ppm would be expected approximately 21 km. away under present conditions. Dow Chemical suggested the same for 15 miles (24 km. = 15 miles). All these calculations pre-supposed the presence of something like 80-90 tons of chlorine still in the tanker; it was not known until late Monday night that 60% of the chlorine had been expelled in the first hours after the derailment.

Taking all these factors into account, and also acknowledging the difficulties inherent in plume calculations, it is worth speculating here that the officials on-scene would have had some justification for evacuating out to a radius of 25 km.: in other words, using the worst possible case based on their knowledge as of Sunday afternoon, the Municipality of Metro Toronto at least as far east as Yonge Street might have been evacuated.

The evacuations of the far western boundaries of Mississauga in the early evening were primarily based on a predicted wind shift to the east (blowing west) that would take place during the night. Police were unhappy about the prospect of having, once again, to move people in darkness in case of an explosion. The last substantial evacuations, of East Oakville and Oakville-Trafalgar Memorial Hospital, were authorized by Halton Regional Police who made the

decision after consultation with officials at the Command Post, and hospital and ambulance officials meeting in the Mayor's office in Oakville.

### 3.3.8 Toward Control

As one senior participant in the Control Group meetings remarked:

*"We found ourselves on Sunday evening having almost by accident completely evacuated a major city."*

This is, as much as anything, a comment on the smoothness of the evacuation operation as conducted by the immediate response agencies (not to mention the mobility of the people of Mississauga). To the people on-site, priority began shifting from getting people away from the hazard, toward both maintaining the furthest extent of the cordon consistent with safety and taking steps to alleviate or eliminate the problem. Although, as has been noted, the evacuees were not advised that they might be out of their homes more than twenty-four hours, it was clear by Sunday night that putting out the fire and patching the chlorine car would take at least another day. In consequence, the agencies on-site began organising shift systems and internal briefings which would allow the components of larger organisations to become relatively autonomous entities dealing with the derailment. Much of this was directed, not towards the maintenance of senior personnel on site - though this did happen - but towards continuing to provide information to the Command Centre group. It was a shift away from the provision of personnel and equipment as the priority. This was justified because the maintenance of the cordon and the resolution of the problem now depended on technical expertise and sophisticated scenario modelling. It is this which more than anything else characterises the "middle period" of the week, and is the focus of the next section.

### 3.4 EMERGENCY CONTROL STRATEGIES

#### 3.4.1. The Holding Pattern

The decisions made on Sunday were complemented by a growing peripheral network of specific agencies, technical support, and affected citizens. Having brought this network into being, the primary tasks of the "controlling" phase of the emergency were the management of the network's constituent parts, as well as the determination to eliminate the chlorine hazard as swiftly as was consonant with safety.

#### 3.4.2. The decision to reorganise the Control Group

The reorganisation of the Emergency Operations Control Group marks the point at which a hitherto loosely defined management structure became clearly divided into an inner core group, and an outer group which could be called upon to "report" to the inner group. In itself, this was merely the most visible of the series of organisational decisions clarifying the already existing relationship among the participants on site. Shift systems and relief of personnel had now come into effect, with agencies such as Atmospheric Environment Service providing site-specific weather information at regular intervals. In addition, other agencies had begun to assist the Command Post by relieving it of certain duties; for example, Peel Region Social Services arranged on Monday to set up an Emergency Information Centre to answer questions from the public and to relay information (see Section 4.3.9.).

The time, place and participants in the decision to limit the group are unrecorded, but it is clear that the central members of the Control Group including Chief Burrows, Mayor McCallion, Chairman Bean and Solicitor-General McMurtry were involved. There had already been complaints about the unwieldy nature of some of the meetings held on Sunday. A further factor was the opening of the upper storey of the Bell building, which allowed for greater seclusion from the media, police communications and agency personnel.



A list was drawn up and read out at the beginning of a meeting at 16:10 on Monday afternoon. There were complaints about the size of the meetings later in the week, but there was also general recorded agreement about the increased effectiveness of the group following the restriction. Meetings and news conferences were now regularised and somewhat later in the week, provision was made for recording meetings as they proceeded. The only negative result was that some useful personnel had difficulty getting access to the meetings.

#### 3.4.3. The Chlorine Car

Even before the fires went out, the emergency entered a new phase, since the senior members of the CHLOREP team had made an initial survey of the chlorine car. The results of this survey indicated that a substantial amount of the chlorine had been expelled during the first explosions following the derailment and that the tear in the chlorine car was substantial. For the Control Group, the first piece of information meant that a reduction in the evacuated area was feasible. For the CHLOREP team, the second piece of information was, if anything, of more importance, since it meant that the Mississauga derailment did not fit into the standard pattern of chlorine tank car derailments (involving small punctures or tears).

The consequences of this information were far-reaching: the CHLOREP team was forced into improvising their operations while, for their part, the Control Group felt prey to a premature optimism. One problem was a lack of communication between the Control Group and the CHLOREP team in these early stages, partly because a codified system for reporting and evaluating activities on site had not yet been established. From the evidence, all relevant agencies were not notified about the expulsion of the chlorine (especially the Ministry of the Environment) and the Control Group failed to appreciate the difficulties in patching the chlorine car itself. This is attributable to the assumption by all parties on site that each party was capable of handling



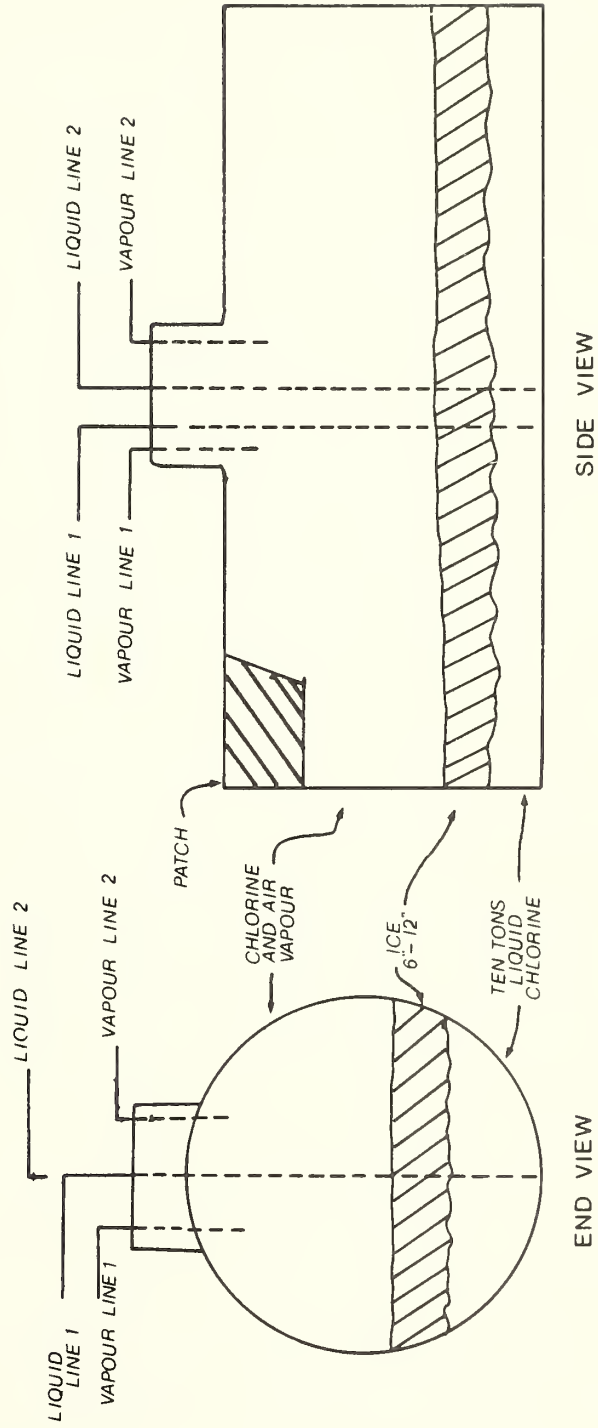
its role in the response without outside scrutiny. In retrospect, it was this confusion that sowed some of the mistrust between parts of the Control Group and Dow Chemical that would come out into the open later in the week.

#### 3.4.4. The decision to allow some re-entry

There is little record available of Tuesday's Control Group meetings. The session, which began at 08:20, to consider the question of allowing at least some re-entry to the evacuated area, took place in the context of a number of new problems; for instance, evacuees who had assumed the evacuation would last a day or less were beginning to harass police at the perimeter (see Section 2.4.1). However, the meetings of the Control Group on Tuesday have been characterised as optimistic, and supportive of the CHLOREP team. With the team attempting to patch the chlorine car, it was expected that the situation would be resolved very shortly and the chlorine car would pose no threat to the population. The most important secondary information was that the hazard itself had substantially diminished - that is, the amount of chlorine remaining in the tank car was much smaller than was previously thought.

The decision to allow some residents to return, but not others, was made by the Control Group augmented by Environment Minister Harry Parrott and Health Minister Dennis Timbrell. Chlorine was still escaping from the leaking tanker, and contrary winds made prediction of effects difficult. However, it was deemed unlikely that harmful chlorine concentrations would be found on the fringes of the evacuation zone. Background readings at this time ranged from 1.2 to 2.5  $\mu\text{g}/\text{m}^3$ , with winds at 8 to 10 km. from the northeast. Nevertheless, it was decided that people would not be allowed to return to the central zone until the chlorine leak had been plugged and the car drained. The re-entry boundaries may have been slightly over-optimistic, since concerns over the safety of a re-entered zone southeast of the site (just east of Highway 10) surfaced later in the week.

FIGURE 3.3 SKETCH OF THE CHLORINE TANK CAR



SOURCE: CONTROL GROUP SKETCH

#### 3.4.5. The evaluation of the CHLOREP team

Just as the problems of unwieldy meetings had brought a management focus to bear on the Control Group, so the failure of the patch and the inadvertent release of what may have been a puff of chlorine on Wednesday morning (Section 2.5.1.) brought out into the open the problem of managing the work of the response agencies on-site. As noted, the general assumption to this point was that there was no need to supervise closely the agencies at work, now including CP Rail, Superior Propane and Dow. The conjunction of events on Wednesday morning caused great consternation in the Control Group. The Fire Chief ordered a halt to all activities by propane and railway crews for a review period.

The Wednesday meeting of the Control Group began shortly after noon. Mayor McCallion complained that the CHLOREP team was not available, and that they had not provided for a back-up team to continue the work while they rested. She complained that no one was managing the disaster (that is, the derailment). There developed a general suspicion that the CHLOREP team was receiving contrary instructions from Dow Chemical. As Roy McMurtry described it later:

*"I thought there was lot of corporate paranoia at Dow and the men on the scene were obviously getting orders from the corporate boardroom to say as little as possible to anybody and that was upsetting."*

(quoted in Cahill, 1980)

As a result of these problems, Greenwood, the CHLOREP team leader at that time, came under stern interrogation when he finally arrived at the "think tank" meeting. Additional members of the team were asked to be on-site, and a 24-hour-a-day surveillance by a CHLOREP member was to be instituted. The Air Resources Branch of the Ministry of the Environment would henceforth scrutinize the CHLOREP plans; the Branch now became the "lead agency" and, in effect, took charge of the pumping operations. The first

consequence of this was a meeting between Van Volkenburgh, Cross, two experts from the University of Toronto, and an expanded CHLOREP team, on Wednesday evening. Cross has described it as a general enquiry into CHLOREP's expertise, and Van Volkenburgh recalls it as *"taking everything back to square one"*.

#### 3.4.6. A New Emergency Response

This new pattern of organisational response created in its turn a closer relationship between the response agencies of fire and police at precisely the time when the question of the transfer of liquid chlorine from the tank car into caustic soda trucks became critical. In addition to their duties maintaining the site and the evacuated areas, the response agencies were responsible for planning for a new contingency - the possible release of chlorine during the transfer. This transfer depended on the ratification of the CHLOREP team's plans by the Control Group.

### 3.5 EMERGENCY RESOLUTION

#### 3.5.1. The decision to allow liquid pumping

At Thursday's "think tank" meeting, the CHLOREP team was asking permission to suck out the remaining 7.5 to 10 tons of liquid chlorine. There were a number of problems and possible dangers, of which the greatest was the possibility that the mixed layer of ice over the liquid chlorine might collapse as the liquid chlorine was sucked out (see Figure 3.2). It was believed that there was already a gap between the layer of ice and the top of the liquid chlorine of a few inches. If the ice layer collapsed of its own weight into the chlorine, the exposed liquid chlorine would vaporise. The likeliest possibility was that the vapour lines already in place would be able to take up the sudden addition of gas. Another possibility, the worst case, was that the pressure of the altered situation inside the car would blow the patch off the gash in the tanker. There would then be a substantial release of chlorine into the atmosphere.

The first half of the Thursday meeting was taken up with an explanation of the situation. It was decided to run a computer model to get an idea of the safe radius in a possible worst-case scenario. An hour later, Van Volkenburgh of MOE returned with the MOE model, and reported that Dow Chemical was running a similar model. The Ministry's model was a "puff" model - a sudden release of 60 kilograms in one second; while Dow modelled a continuous release of 60 kilograms a minute. The calculations were based on a wind speed of 10 kilometres per hour, and a specific height release of 10 metres. The Ministry's results were 25 ppm at 2 kms. for 80 seconds; while Dow predicted 2 ppm continuously at 1.6 kms.

As the acceptable limit for exposure to chlorine had already been set at three parts per million for fifteen minutes for industrial workers, it is clear that there was some possibility of serious risk to persons as far as three kilometres from the site. Complicating the matter further, the wind was blowing from the west due east. The wind was forecast to change to the north at 22:00 for a period of seven hours. There was therefore insufficient time to remove the entire remaining quantity of chlorine from the tank car.

The main consideration was, of course, the remaining evacuees now out of their homes for five days. Maintaining the cordon became increasingly difficult, and much police time was now spent either conciliating those who appeared at the lines or ferrying people back and forth from the lines to their homes. As Chief Burrows remarked:

*It's not easy for the people, but it's very difficult for us to keep them out as well without using enforcement which the people may not think we have the authority to use, and the law is not clearly defined in that area.*

(Control Group Meeting Transcript)

For the Control Group, the issue of the evacuees had also become the issue of their own competence and authority. One clear result of this was the determination to be as sure as possible,

not just about the minimization of risk, but about the theoretical justification for each decision. Thursday's meeting records a long and difficult debate about the nature and determination of risks.

It is also quite clear from this record that the strongest constraints on free action by the participants at this stage involved both the tiny fraction of people who had refused to evacuate, and the section of re-entered people southeast of the site. The new contingency plan for re-evacuation depended heavily on their presence.

It was finally decided by the Control Group to allow the draining, but to postpone the transfer until after 22:00; it could then proceed, provided that no pumping began without the express authorisation of MOE.

With the decision to pump ratified, the deployment of immediate-response agency personnel began, with the Fire Department prepared to create a curtain of water in case of a leak, and the Police Force prepared to race through the streets ahead of the hazard, warning the residents to evacuate. Plans were drawn up to move the Command Post to Burnhamthorpe Road. Sound trucks would go again through the streets. RCMP, OPP and MOE personnel would be stationed at various points around the perimeter of the site (see Section 2.6.1.).

For these agencies, Thursday night could have been - in a limited sense - a replay of the previous Sunday's events; and the mounting of this preparedness, with its interlocking communications and response network, was a tribute to the now smoothly integrated management structure on-site.

### 3.5.2. The decision to allow final re-entry

With the transfer of chlorine largely completed (see Section 2.7.1.), the last major decision was dependent on the simple timetable for final elimination of the remaining chlorine. The Control



Group meeting which convened at 10:05 Friday was forcefully reminded of the insistent pressure being brought to bear by the remaining evacuees. A Mr. Karskavitch of the Canadian Transport Commission had been quoted in the previous evening's Toronto Star as saying that:

*....the danger had passed and he could see no reason why the rest of the evacuees could not move back today.*

The nature of the danger, and the pressures at the perimeter, were thus placed side-by-side right at the start. Mayor McCallion stated flatly that nobody was in control of managing the technical aspects of the emergency, while the Solicitor-General suggested that:

*The situation has been pretty well under control from the early hours of Friday morning.*

Others noted the prospects for an eventual inquiry into the week's events.

All these concerns had an impact on the quality of the rest of the meeting, which, after a technical briefing, was spent in an attempt to provide a systematic rationale for allowing the re-entry of people into the central zone around the derailment site, a zone that could not be guaranteed 100% safe until the chlorine car was completely empty. This might take another two or three days. The Control Group used the previous meeting's decision-making process as the standard by which to judge the merits of the present decision. The Solicitor-General noted that the high-risk period in pumping out the liquid chlorine had been at the beginning of the operation, and went on to say:

*Having had the benefit of 14 hours....the risk, while not entirely eliminated, has become increasingly remote, and all we can do if there is a puff is follow it, alert people....We've never said there is a 100% guarantee because, but again, we've avoided trying getting right down to the bottom line because it's like any one of us deciding what risk we're taking every time we get into our automobile.*

Winds were expected to blow to the north for the next 24 hours; only two tons of chlorine were estimated to remain; and a vacuum pump hookup could be activated in case of sudden releases.

Agreement was reached that evacuees west of the Credit River and south of the QEW could return, but that police would once again be deployed downwind (north of the site) in case of any release of gas during the transfer. Until the liquid lines on the tank began drawing vapour, a "buffer zone" around the derailment site would remain (see Figure 2.6).

When this happened, an unrecorded meeting of the Control Group allowed the final re-entry into the central zone (see Section 2.7.1.) The management problem was now reduced to making the return as orderly as possible, a responsibility once again devolving on the police and on the Ministry of the Environment and Public Health monitoring teams who responded to alarm calls from returning residents concerned about possible concentrations of chlorine in their homes.

#### 3.5.3. Management and Clean-up

Inside a strict cordon around the derailment site itself, the CHLOREP team and the CP Rail crews spent a further four days transferring the last of the chlorine and removing the car. This was the beginning of the "clean-up" phase, and it coincided with the steady reduction in other emergency personnel around Mississauga. Ministry of the Environment and Fire Department personnel were the major monitoring agencies during this period, while other agencies returned to normal.

Analysis of contaminated seepage from the rail bed, and final removal of 30,000 cubic metres of contaminated soil were the last official organisational activities related to the derailment. Detailed analysis by MOE representatives of the soil continued for some weeks, and became part of controversy surrounding the removal of the soil.

Ultimately, however, the important organisational response in this phase of the derailment was the review and incorporation of lessons learned during the week's events. For some agencies,

such as AES and the Ministry of the Environment, Mississauga served as a revelation of equipment deficiencies and of broader conceptual difficulties associated with the fact that they were now in the business of responding to emergencies. Contingency plans and emergency equipment have since been put into place.

For other agencies - especially immediate-response agencies, e.g. Police, Fire - operational lessons have been combined with a new awareness of other agencies. For example, the new Peel Region emergency plan is designed to streamline alert procedures between immediate response agencies and support services. At the provincial level, attention has been focussed on the problems of municipal emergency response, with the result that new legislation is being proposed to fill the legal vacuum within which response to emergencies now operates.

Most important of all, Mississauga's derailment has brought out the growing problems posed by the transport of hazardous materials along increasingly urbanised transportation corridors. The resolving phase of the organisational response is not finished.

### 3.6 EVALUATION OF THE ORGANISATIONAL RESPONSE

The success of the organisational response was due, in large part, to often-exercised and therefore appropriately tailored local emergency procedures. During the immediate response, or "tactical" phase of an emergency, speed is the essential characteristic, including speed of arrival of personnel and equipment, and speed of initial correct assessment of the magnitude of the emergency. For this reason, emergency plans for organisations responding to this phase of an emergency are, of necessity, detailed and specifically directed. For the initially responding agencies - police, fire and ambulance - plans of this sort are a fact of daily life; and no serious criticism can be made of what were their own operational strengths.

The transition from short term response to longer term control cannot easily be organised in detail beforehand. It is enough to have planned the potential for creating a workable managerial structure. As the police response was the core around which the structure of control grew, it was clearly advantageous to have a structure embedded in the Police Disaster Plan, which itself was versatile enough to monitor the event, establish media liaison, and expand to include the Emergency Operations Control Group; this was the Police Command Post. While this part of the transition worked well, even in the face of what could have been jurisdictional disputes, other parts did not. The reasons can be traced back to the fundamental problem of shifting from internal emergency response procedures to inter-agency emergency response procedures. For whatever reason, the integration of local social services into the response was not carried out early enough, and was never carried out completely during the week. It is understood that this situation is being rectified in the new Peel plans.

With the broadening and lengthening of the impact of the derailment, the handling of the off-site social and political concerns became as important to a successful resolution of the event as the removal of the physical threat. This called into play a new range of key actors, whose managerial and political skills were successfully integrated into the command structure. In addition, the key actors already on-site were drawn more and more into combining a managerial with an emergency response function. This was facilitated by the managerial roles already being played by the heads of the immediate response agencies.

One interesting quality of the Mississauga derailment was that at the same time as the transition from immediate emergency response agency to managerial agency was proceeding in, for example, the Peel Regional Police, the reverse was occurring in other agencies as they became suddenly aware that they might have to create an immediate (and previously unplanned) emergency response

capability. The problems relating to the MOE Air Resources Branch and Atmospheric Environment Service have been singled out; but a similar situation occurred at other points. They can also be traced back to a fundamental element in successful emergency planning: imagining how resources might be called upon in a variety of circumstances. Imaginative flexibility before an emergency is as important as flexibility during the emergency in ensuring that resources will be available on demand. In general, the more resources which can be made available, the more flexibility (the more "options") the emergency response is likely to have.

The controlling phase was characterised by the successful maintenance of the immediate and supplementary responses, and of the confidence of the people who were still evacuated. The first success was dependent on the Command Post structure which provided a reference point for all those agencies that became semi-autonomous response agencies, on-site. The second success was dependant on the well organised police-media relationship, and on the successful initial evacuation. It was most dependent, however, on the clearly understood policy that the evaluation and resolution of the problem by the Control Group and the technical teams, had not only to be done, but had to be seen to be done.

As the week progressed, this last concern - the maintenance confidence - became of equivalent importance to the evaluation of the risk, since a lack of belief in the former would have rapidly translated into a lack of belief in the latter. Successively closer examination of the risks and proposed solutions resulted in new configurations of the organisations involved; but, as at the outset, these built upon the successful deployment of the immediate response agencies at the beginning of the week.

Ultimately, this success and the continuing success of the organisational response during the week was due to a fortunate series of circumstances. It is certainly the case that an alteration in the initial conditions of the emergency could have radically changed the nature of the subsequent organisational response.

While the creation of scenarios is fraught with difficulties, one quite plausible "what if" is that if the chlorine car had ripped wide open during the derailment, the rolling forward of a cloud of chlorine would have rendered all immediate emergency response, except for a desperate midnight race through the streets ahead of the cloud, useless. Car traffic through the cloud would have been impossible. It is very likely that even at the edge of the cloud, with concentrations of 1 ppm, there would have been great confusion as people were faced with the effects of the gas, darkness, and traffic chaos.

Closer to the derailment site, estimates have suggested that the number of deaths within half an hour could have been in the thousands. As one expert remarked in an interview, the most difficult part of the emergency response would have been finding enough morgue space for the bodies.





## **Chapter 4**

### **ORGANISATIONAL RESPONSE : MEETING COMMUNITY NEEDS**



#### 4.1. INTRODUCTION

The previous chapter has outlined the development of organisational response to the Mississauga emergency itself. Equally important is the organisational response involved in meeting the community needs of the quarter of a million people who were evacuated. These needs can be divided into four sections - the needs of:

- (a) the general public;
- (b) those in Evacuation Centres;
- (c) those in institutions, group homes or receiving special care in their homes;
- (d) the people working at the accident site.

Several agencies were involved in meeting community needs for more than one of these groups. The evacuees' perceptions of how these needs were fulfilled are discussed in the following two chapters (5 and 6).

#### 4.2. THE GENERAL PUBLIC

The vast majority of evacuees evacuated themselves, usually by car, and went to stay in private homes and hotels (Chapter 5). While they were away, they needed information about what was happening and when they could return home, some of which was supplied by the media. Many of them left pets behind, and were concerned about their well-being. Some, particularly those who had not taken necessary medication with them, needed access to health care, and in particular, their own physicians. On return, some needed information on concerns about chlorine gas or spoiled food.

#### 4.2.1. Information

Although there was much information about the evacuation transmitted by radio and television, many evacuees wanted to contact authorities about what was happening and when they could go home. Others had specific enquiries about their concerns. The Peel Regional Police Communications Centre phone lines were constantly busy and became overloaded with phone calls from evacuees. On Monday afternoon, Jim Crozier, Commissioner of Social Services for Peel, offered the use of the Regional Office as a Regional Emergency Information Service to take the load off the police. The Bell Telephone computer was instructed to automatically channel all calls coming in to the Police Communication Centre from the public to the Regional Office. The Social Services staff manning the phones were fed the most up-to-date information coming from the Command Post. This service started at 15:00 on Monday and was maintained on a 24 hour basis until noon on Saturday. In that time, there was an estimated 28,000 calls - a number which represents an average of one call from approximately 43% of the households evacuated. The public could also obtain information by phoning the City Hall switchboard, again on a 24 hour basis. For a discussion of the public perception of their information needs and how they were filled, see Section 5.9.

#### 4.2.2. Pets

Beginning Monday, concern about the well-being of pets left behind caused many people to try to get back into their homes to pick up or feed them. Police let some people through near the perimeter, but many others were refused. Meanwhile, Tom Hughes, Director of the Ontario Humane Society, Len Addison, Supervisor of Animal Control for Mississauga,

Chairman Frank Bean, and Staff Inspector MacDonald of the Peel Police, set up a feeding program that went into effect on Tuesday at 16:00 hours.

Through the news media, the public were asked to bring written permission for Ontario Humane Society personnel to enter their premises and their house keys to depots at OHS branches in Toronto, Brampton, Scarborough and Mississauga, and City Hall. An OHS staff member, accompanied by a police officer, was then able to enter each home to give food and water to the pet(s). The pets in the earliest areas evacuated were fed first because they had been left the longest. OHS from branches all over southern Ontario assisted in the operation. By Friday, at 20:00 hours, OHS personnel had entered 1,861 homes, stores and other premises to feed, water and care for over 2,500 animals and birds. The problem of pet care is also discussed in Section 6.11.

#### 4.2.3. Health Care

Mississauga Hospital was evacuated for the full week and doctors in private practice, and their answering services, were also evacuated. Although evacuees had access to medical services in the area to which they moved, they usually did not have access to their own physicians, or to their medical records. This was particularly a problem for those who left without necessary medication - it was difficult to quickly and easily obtain it from strange physicians without any medical records.

There was no pre-planning that anticipated this situation and there was no response until Wednesday, 15 November, after many of the evacuees had returned home. This response was solely on the initiative of Dr. Andrew Sarne,



Director of Emergency Physicians at Mississauga General Hospital, who stayed behind after the evacuation to help people who did not leave the evacuated area. He maintained contact with the six key medical staff in the hospital emergency department and offered their services to the Command Post early on, but was declined. On Wednesday, with cooperation from the Peel Police, Dr. Sarne went into the Emergency Department of Mississauga Hospital for the necessary equipment to set up a mini-emergency service on a 24 hour basis at Apple Hills Medical Centre at Bloor and Dixie. Appiewood Medical Associates, Dixie Road Medical Associates, and the Streetsville Medical Centre were opened during the day to administer to non-emergency health needs. These clinics were publicised on the media, via the Command Post, starting Wednesday evening. Unfortunately, the media coverage was not extensive, and many evacuees, including doctors, did not hear about them.

The only other provision made during the emergency to allow contact between doctors and patients was that attempts were made to inform pregnant mothers and those requiring surgery about which hospitals their physicians had been granted visiting privileges at during the emergency.

When people began to return to the evacuated area on Tuesday, many were concerned about the residual effects of chlorine on health, and about spoiled food. Others smelled gases in their homes, businesses or schools. In response to these concerns, the Peel Regional Public Health Unit set up a 24 hour phone service in their regional offices to provide information on chlorine and food spoilage. It operated from Monday morning to Sunday noon. Reports of gas were checked by Public Health personnel (the Ministry of the Environment also answered reports called in to them by going out and checking). The public were advised to throw out doubtful food by the

Public Health Department, via Command Post news releases starting on Tuesday 14 November. The Fire Chief also issued press releases warning residents to air their houses when they got home. Halton Regional Health also maintained a 24 hour phone information service during the emergency. The Medical Officer of Health, Dr. Cherkas, and the Director of Environment, Clifford Clark, spent time each day at the accident site as liaison between the Peel Regional Health Unit and the Control Group.

#### 4.3. THE EVACUATION CENTRES

##### 4.3.1. Selecting the Centres

Although the Evacuation Centres sheltered only about 5% of those evacuated, they were the primary focus of the effort to meet community needs. This section will trace the evolution of the Centres from the time they were chosen, through set-up and operation to their closure, and how the various agencies responsible organised their efforts.

The major Centres (the high schools in Mississauga, Streetsville, Brampton, Burlington and Malton; the Sheridan College campuses; the shopping malls and the International Centre) were initially opened by the relevant school boards or administrators in response to police requests.

The other, smaller Centres were initiated by the organisations that opened them; in most cases, the police were informed of, and publicised, their existence. Except for Brampton Scout House, the 707 Galaxy Club in Oakville (a Union Hall), and the Malton Optimists Club, the Centres which opened on their own looked after very few people and/or were short-lived. The first three were well run, had adequate facilities and reported

no organisational problems. Information on the Centres which were opened, their location, the length of time they stayed open, and the number of evacuees passing through each Centre is provided in Figures 4.1 and 4.2, and Table 4.1. There were also several offers of facilities for use as Centres from various groups, but these were never used (Table 4.2).

The police have a list of potential Evacuation Centres and the phone numbers of key personnel to call to request their use in an emergency. The Peel Board of Education have an "on duty" inspector who can be reached through the Streetsville answering service, which can contact whomever is on duty at any particular time, by phone or pagette. The contact person that night, Mr. I. Fraser, alerted Superintendent of Business Affairs, H.J.A. Brown, who arranged with police to open schools as needed. In this emergency, Mr. Brown set up a Board of Education Operations Centre at 15:00 hours at the Kennedy Road field station in Brampton, and the police contacted him as the evacuation expanded to request that additional schools be opened. An over-estimation of need, in Mr. Brown's opinion, led to the unnecessary opening of the two Malton secondary schools when Turner and Centennial schools in Brampton could have comfortably handled the few hundred people staying in the former.

Harley Lischman, Area Superintendent of Plant Operations for the Halton Board of Education was similarly contacted by the Halton Police and requested to make secondary schools available for Evacuation Centres. Mr. Jack Porter, President of Sheridan College was contacted by Peel Regional Police for permission to use the Oakville and Brampton campuses as Centres. The senior staff of the schools and colleges used as Evacuation Centres were important in assisting the set-up and operation of the Centres, particularly in making facilities available

FIGURE 4.1 TIMES AT WHICH EVACUATION CENTRES OPENED AND CLOSED





Table 4.1.1 Evacuation Centres used in Mississauga Emergency

Name of Centre	Location	Number of Evacuees	Destination of Evacuees When Centre Closed
Holy Name of Mary School	Mississauga	50	Erindale Secondary School
Square One Shopping Centre	Mississauga	7,000	Streetsville Secondary School/ Sherway Gardens
Erindale Secondary School	Mississauga	500	Streetsville Secondary School/ Morningstar Secondary School
Sheridan Mall Shopping Centre	Mississauga	150-200	Sheridan College (Oakville)/ Erindale Secondary School
Trafalgar Hall	Oakville	9	Sheridan College (Oakville)
Sheridan College, Oakville Campus	Oakville	435	Home or hotels
Sherway Gardens Shopping Centre	Etobicoke	2,000	J.A. Turner Secondary School/ W.J. Fenton Vocational School/ Brampton Centennial Secondary School
E.C. Drury School for Deaf	Milton	170 from Extendicare Nursing Home 49 from Carmel Heights Home for Aged	Back to residences
Streetsville Secondary School	Streetsville	700-800	Royal York Hotel/ Holiday Inn, Scarborough
Seventh Day Adventist Community Service Centre	Mississauga	10	Unknown
707 Galaxy Club	Oakville	72	Home or elsewhere



Evacuation Centres used in Mississauga Emergency (cont'd)

<u>Name of Centre</u>	<u>Location</u>	<u>Number of Evacuees</u>	<u>Destination of Evacuees When Centre Closed</u>
Vic Johnson Arena, Recreational Centre	Streetsville	75-100	Streetsville Secondary School
Brampton Centennial Secondary School	Brampton	300	Holiday Inn, Scarborough
J.A. Turner Secondary School	Brampton	200	Streetsville Secondary School
W.J. Fenton Vocational School	Brampton	200	J.A. Turner Secondary School
Solel Congregation	Mississauga	20	Billeted to families in Congregation
Milton Optimists Club	Milton	70	Home
St. Joseph's Roman Catholic Church	Streetsville	4	Home
International Centre	Malton	1,000	Home
Erin Mills Lodge Retirement Home	Mississauga	50	Streetsville Secondary School
Brampton Scout House	Brampton	120-150	Home
Morningstar Secondary School	Malton	245	Streetsville Secondary School
Westwood Secondary School	Malton	163	Streetsville Secondary School
Sheridan College, Brampton Campus	Brampton	471	Travelodge Hotel (North York)

Evacuation Centres used in Mississauga Emergency (cont'd)

<u>Name of Centre</u>	<u>Location</u>	<u>Number of Evacuees</u>	<u>Destination of Evacuees When Centre Closed</u>
101 Legion Hall	Etobicoke	70-75	Home
M.M. Robinson School	Burlington	425	Home
Knightsbridge Senior Citizens Centre	Brampton	19	Sheridan Villa Home for the Aged
Dolphin Road Senior Public School	Streetsville	40	Streetsville Secondary School
Moose Hall Lodge	Etobicoke	10	101 Legion Hall
Ravasa Scout Camp	Hockley Valley	24	Home

Table 4.2 Additional Evacuation Centres that were established or offered but not used.

<u>NAME OF CENTRE</u>	<u>LOCATION</u>	<u>TIME ESTABLISHED OR OFFERED</u>
Mississauga Valley Recreation Centre	Mississauga	03:54 Sunday, November 11, 1979
Applewood Heights Secondary School	Mississauga	05:00, Sunday, November 11, 1979
Erindale College	Mississauga	07:26, Sunday, November 11, 1979
#2824 Royal Canadian Army Cadet Corps	Mississauga	11:00, Sunday, November 11, 1979
Grace United Church	Brampton	13:00, Sunday, November 11, 1979
St. Paul's United Church	Brampton	13:00, Sunday, November 11, 1979
Hamilton Conference Office of United Church	Hamilton	12:00-24:00, Sunday, November 11, 1979
Five Oaks Training Centre - United Church	Paris	12:00-24:00, Sunday, November 11, 1979
Lester B. Pearson Secondary School	Burlington	18:00, Sunday, November 11, 1979
Century Gardens	Brampton	Sunday, November 11, 1979
St. Mary's Roman Catholic Church	Brampton	12:00-24:00, Sunday, November 11, 1979
Brampton Knights of Columbus Hall	Brampton	Sunday, November 11, 1979
Trinity Anglican Church	Streetsville	Sunday, November 11, 1979
Adult Training Centre	Brampton	Monday, November 12, 1979

as they became necessary. The number of Evacuation Centres increased as the evacuated area expanded over Sunday, 11 November (Figure 4.1).

#### 4.3.2. Opening and Staffing the Centres

Those places selected had to be opened and set up as Evacuation Centres. In some cases, this was done before the evacuees began to arrive in large numbers. In other cases, the Centres were announced to the public, both by the police and by the media, before they were ready, and this caused confusion.

The first people on the scene at the major Centres were school staff, or management staff of the malls and International Centre. Centres that opened on their own were generally set up and operated by the groups that made them available, sometimes without outside help. The police contacted the Red Cross and informed them of the opening of the major Centres, except for Sherway Gardens, Westwood Secondary School and the Brampton campus of Sheridan College, where St. John Ambulance were asked to take charge. By the time these organisations had mobilised and arrived on the scene, the local community were often already helping to set up the Centres. These included church groups, service clubs, individual volunteers, and the Boy Scouts and Guides.<sup>1</sup> At the International Centre, Scouts and Guides set up and ran the operation for the first few hours, until a Red Cross team arrived.

Before it was realized that people would be out overnight, the focus of the organisation of the Centres was: the

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<sup>1</sup> 'Scouts' here refers to Cubs, Scouts, Venturers and Rovers, the different age groups in the Scouting Organisation. 'Guides' refers to the Pathfinders and Rangers, the older age groups in the Guide Organisation.

registration of evacuees to help find missing family members and friends; the provision of drinks and snacks; and informing the evacuees about what was happening. When it was realized, later on Sunday, 11 November, that people would be out overnight, it became necessary to find blankets and, where possible, something to sleep on (such as gym mats in schools). More substantial food, medical services, separate rooms for sleeping, nurseries for babies and mothers, were also needed. These services had then to be maintained throughout the operation of the Centres.

The Red Cross were identified by the police in Peel and Halton Regions as the key volunteer agency to coordinate the operation of the Centres. In recent years, the Ontario Division of the Red Cross has been setting up separate Emergency Services divisions in their Branches, headed by volunteers who are trained in coordinating Evacuation Centres and other emergency services. Each Branch has a trained Emergency Coordinator and a core group of volunteers who have also received some emergency training. The Red Cross makes these teams available to the authorities, if requested, in emergencies to provide a coordinating function - to coordinate the various services required, and provided by, the agencies and individual volunteers available. This is not an official role conferred on them by the Province, nor is it a role that has been agreed upon formally by the various volunteer and government agencies, in most municipalities, or on a province-wide basis. The Red Cross also specialises in operating Registration and Inquiry in evacuations and has experience in providing first aid and food services.

Margaret Leslie, the Emergency Coordinator at the time for the Mississauga Branch of the Red Cross, was contacted by police within one-half hour of the derailment (see Section 3.3.1).

She came to the site and when it became apparent that evacuation was necessary, she was asked to open the first Evacuation Centre at Square One. As the evacuation expanded, the numbers at Square One, and the necessity to open a second Centre at Erindale Secondary School, meant that the Mississauga Branch could not handle the work load. In such a situation, the Branch calls in their back-up Branch (which was done - North Peel was alerted early in the morning). If further help is needed, which it was, the Ontario Division is alerted. Ken McBride, the Emergency Services Director for Ontario Division, was called at 04:45 by Margaret Leslie for assistance. He in turn called his Assistant Director, Mrs. Millie Blair, and then began to alert the emergency coordinators of nearby Branches to be on standby to go to Mississauga when requested by the Mississauga Branch or the police. As Centres opened during the day, Ontario Division Emergency Services Command and Control was established at Ontario Division Headquarters under the command of the Chairman of Emergency Services, Brigadier-General James Westhead. He contacted Branches which sent out emergency service teams to coordinate a new Centre, or, later in the week, to replace a team which had completed their shift. Tom Huntley, Emergency Coordinator of the North York Branch, was made the Red Cross liaison for the Ontario Division at the site on Sunday evening.

St. John Ambulance, which coordinated three of the Centres, normally provides back-up to Ontario's ambulance services, and is trained to operate first aid posts wherever required. The Halton-Peel Corps of St. John were the first to get involved, when one of their divisions came early Sunday morning to the accident site to set up a first aid post. They soon alerted the Halton-Peel Corps Superintendent. As Evacuation Centres opened, Halton-Peel Corps' divisions sent units to operate First Aid posts.



By 06:00, realizing the extent of the emergency, the Halton-Peel Corps called the Provincial Commissioner of Ontario Brigade, Col. J.M. Sutherland, for assistance. He called the Metropolitan Toronto Corps who mobilized later Sunday morning to set up a Control Centre at Sherway Gardens. They were almost immediately asked to open Sherway as an Evacuation Centre, which they did, and when it was closed Sunday evening, were asked to operate Centres at Westwood Secondary School in Malton and Sheridan College, Brampton. Col Sutherland set up the Ontario Brigade Control Centre at Sheridan College, from which he organised shifts of 50-100 St. John volunteers to man the first aid posts at various Centres. Halton-Peel and Metro Corps also had their Control Centres at Sheridan College.

#### 4.3.3. Registration and Inquiry

In the operation of the Evacuation Centres, Registration and Inquiry was very important in controlling who was in the Centres and in tracing missing people. Evacuees were asked to fill out a form provided by the Red Cross and to check out and in with the registration desk whenever they left temporarily, and check out, stating where they were going, if they left permanently. A central registry of names from all the Centres was kept at Red Cross Command and Control. If Registration and Inquiry was established before evacuees arrive, it was much easier to keep out non-evacuees, some of whom caused disruption and even vandalism.

#### 4.3.4. Food Services

The provision of food services was one of the strong points of the Centres. In some cases, particularly at the

International Centre, there was eventually too much food. Food came from many sources. Local stores opened their doors and allowed Centre volunteers to help themselves. Food wholesalers donated mountains of bread, baked goods and sandwich fillings. Church groups, service organizations and individuals made sandwiches, cookies, etc. and brought them in. Restaurants, particularly McDonald's, brought in large quantities of hamburgers, breakfasts and chili. The Salvation Army made sandwiches or bought food and brought it to the Centres. Peel Regional Social Services bought hot dinners from Air Canada's Cara flight kitchens and served the remaining evacuees at the International Centre on Thursday and Friday. The Kinsmen capped a week of tremendous assistance by preparing a full course roast beef dinner served on linen tablecloths and china for the evacuees at the Streetsville Secondary School on Wednesday evening, 14 November, before they were bussed to hotels in Toronto. Whatever else, no one went hungry.

Food preparation and service was either provided by the kitchens at the various schools, with volunteers assisting the regular kitchen staff, or in the case of the International Centre, organised by the Salvation Army, with assistance from the Boy Scouts and the Pathfinders from the Seventh Day Adventist Church. The latter was a difficult task because of the number of people at the Centre and the lack of any kitchen facilities, including refrigeration.

#### 4.3.5. Health Care

Health Care was provided by the St. John Ambulance with assistance from Peel Regional Public Health Nurses. The Public Health Nurses provided nursing care and checked for public health problems, particularly at the International Centre,

where they were on duty 24 hours a day. Halton Regional Public Health Nurses helped at Peel Evacuation Centres on Sunday, and at those in Halton from Monday onwards. Peel Regional Health also provided health inspectors from the Environment section to check for food spoilage as did Halton Regional Health at the Halton Centres.

There were no doctors available at the Centres which made it more difficult to obtain medication for those who did not bring it with them, or ran out. St. John Ambulance personnel had to take a description of the person's condition and of the drug, or an empty bottle, to a pharmacist, who had to contact a doctor to confirm that it was the correct medication. The advice and skills of doctors would have been valuable to help treat those with medical needs.

In Centres established in schools, it was possible to have a separate room for health care in the school health office and a quiet room for people who were sick.

#### 4.3.6. Communications

To facilitate communications, the Red Cross has a formal agreement (signed just days before Mississauga) with the Amateur Radio Emergency Services (ARES) arm of the American Radio Relay League to provide amateur radio communication services, when required, in emergencies. The ARES network were standing by throughout Sunday waiting to be called in. The increasing number of Centres and overloaded phone lines prompted Ken McBride to call ARES at 18:00 hours Sunday for help. By late Sunday evening, there were radio operators in all of the major Centres, and at the accident site and the Command and Control. They were invaluable in providing information transfer between the Command Post and the Evacuation

Centres via Command and Control, particularly in tracking down "missing" evacuees through the Registration and Inquiry system.

The telephone was the other mode of communication and extra lines were put into some of the Centres by Bell Telephone. In the schools the main office was used for phone communications by those in charge. As elsewhere, the phone lines often became overloaded.

The evacuees themselves received information from several sources. Where a P.A. system was available, announcements were made to the evacuees by the organisers as they received word from the Command Post. Many evacuees had radios, and televisions were either made available by the facility itself, or were brought in on loan from local businesses. The major Toronto newspapers were distributed free to the evacuees, as well.

In some cases, evacuees heard reports over the radio and television before those in charge of the Centres heard officially from the Command Post. If the report was wrong (for instance, reporting the wrong area being re-opened), it created confusion for both evacuees and coordinators, until the latter received official confirmation. Rumours were referred to the Red Cross liaison at the site who reported back a denial or confirmation to the Centre once he had carefully checked their veracity. This was then reported to the evacuees.

At one Centre, someone proclaimed to a gym full of people on Tuesday night that everyone could go home - there was a stampede for the doors, and organisers had a difficult time calming people and convincing them that they could not go home after all.

#### 4.3.7. Other Volunteer Services

In the schools, separate rooms were set aside as nurseries for mothers and babies, as playrooms for children, or quiet rooms for people who needed some privacy; gyms were available for recreation; and sleeping and eating quarters could be separated, making life more comfortable for evacuees. Gym mats were used for evacuees to sleep on, and blankets and some sleeping bags were brought into the Centres, primarily loaned by the Canadian Armed Forces. The schools also had adequate washroom facilities, and were able to provide showers to the evacuees. Volunteers helped look after the children, running games and activities for them.

The Salvation Army, as well as running the food service at the International Centre, worked in several Centres offering counselling to those in need, and fetching and bringing in supplies and blankets. They also supplied money and food to families in need who were returning to their homes. The Etobicoke Temple of the Salvation Army, under Major Ken Holbrook, was called in on Sunday evening by the Mississauga Temple's Director, Captain Robert Ratcliffe, to run the food service at the International Centre and assist with the other activities that the Salvation Army was performing at the Centres.

Supplies such as diapers, toothbrushes, soap, etc., were provided free by local stores, or bought by Peel Region Social Services.

Where possible, pets and their owners were put in one section of a Centre. Because blankets were collected each morning, it was important not to redistribute them to non-pet owners who might be allergic. Pet food companies and the members of the St. Francis of Assisi Anglican Church in Meadowvale provided free pet food to the many animals also sheltered in the Centres. Some pets were taken to private boarding

kennels in Oakville, on Wednesday, when people moved to hotels and could not take their animals with them.

Much of the work done in carrying out the functions of the Centres was performed by the Scouts and Guides. The Mississauga Scout leaders were mobilized early Sunday morning by the District Commissioner, Frank Holt. They first went to a Streetsville church to make sandwiches for the personnel at the accident site and to help out at the Erindale Secondary School. They later moved on to the Streetsville and Brampton Centres, often being there early enough to help set up. Mississauga Scouts also opened their Ravasac Camp in the Hockley Valley to shelter some families from the Evacuation Centres.

Early Sunday evening, November 11, the Brampton Scouts under District Commissioner Tony Noronha, reported to the Brampton Centre to assist, and set up their own Evacuation Centre at the Brampton Scout House. The Brampton Legion supplied food, and St. John Ambulance sent a first aid team and blankets over from Sheridan College. The Brampton Legion provided food to the Centre, which looked after more than 100 people at its peak.

At the same time the Brampton Scouts were moving into the Brampton Centres, Mike Sharples, Director of the Malton District, moved a team into the International Centre. The Scouts were the first volunteer group there and set up and ran the Centre until the Red Cross came later in the evening. The Scouts worked tirelessly all week at the Centre. On Wednesday night, Frank Holt called the Provincial Office, which sent in Scouts from the west sub-region of the Greater Toronto Region and from York Summit to help the exhausted Malton crew. Holt acted as the overall coordinator of Scout operations, arranging for replacement shifts and making sure no Scouts went longer than 12 hours without sleep.



Lillian Poulin, Area Deputy Commissioner of the Guides, alerted Guide leaders around Mississauga on Sunday morning, 11 November. She told them to go to the Centre nearest their area, where they helped with Registration and Inquiry, child care and food service.

, Other groups helping with the general operation of the Centres were local service clubs, particularly the Kinsmen, Lions Club and Rotary; Sea, Air and Army Cadets from some of the Corps in Mississauga and surrounding communities; and local churches and church groups. Their involvement depended on their own initiative. If they volunteered in person at the Centres, they were involved; if they phoned in an offer of help, they were not used. Generally, the groups from the evacuated area itself were not involved.

The Service Clubs brought in food, offered their homes to evacuees, and helped out at the Centres. The Kinsmen were particularly involved and well organized. By chance, the Deputy Governor of all the Clubs in and around Mississauga, Bill Pycock, had a business meeting of Club Presidents in his Zone on Sunday morning in his Meadowvale home. When they realized the extent of the emergency, they alerted their members and were able to muster a large number of volunteers, with Pycock acting as coordinator of their operations.

#### 4.3.8. Peel Region Social Services

Commissioner of Peel Regional Social Services, Jim Crozier, who found out about the accident on the radio early Sunday morning, called his senior staff to the Sheridan Villa Home for the Aged (Social Services are responsible for the Homes for the Aged) later Sunday morning, and set up a Command Post. When Sheridan Villa was later evacuated.

their Command Post was moved to the old regional office at 150 Central Parkway Drive in Brampton. From the Command Post, the Commissioner and senior staff assisting him could coordinate the responsibilities of the Social Services and maintain contact with the site and the Centres. They did not have a staff person at the site, and this turned out to be a problem in getting the necessary information to carry out their responsibilities as capably as possible.

In general, Crozier regarded Social Services as a back up agency in this emergency, providing assistance wherever it was needed, not as the lead agency co-ordinating the provision of community needs. Crozier assigned a resource person from his senior staff to each of the major Centres. This person acted as a liaison between the Centre and Social Services to help provide whatever needs the Centre was unable to fill elsewhere. The Commissioner arranged for local pharmacists to supply medication to those who required it, and bill Social Services for the costs. The resource person could provide funds for purchasing supplies when necessary, such as toothbrushes and soap, and also gave funds to families who had run out of money and had come to a Centre from hotels. Social Services also helped to find supplies needed at the Centres, for example, tracking down blankets from the Army. There were four day-care centres closed during the emergency, but most of their staff did not report to the Social Services office. They could have been used to help with young children at the Evacuation Centres.

In Halton, Rennie Vivian, administrator of Social and Family Services, arranged for catering of meals to the M.M. Robinson Secondary School and provided staff to assist in operating the Centre, both of which were the responsibility of this agency.

#### 4.3.9. Individual Volunteers

The final component in the organization and operation of the Centres was the use of individual volunteers from the local community and the evacuees, themselves. Many individuals brought in food, such as homemade muffins and cookies, and many came forward to volunteer their homes to evacuees or their time to work in the Centres. Many evacuees volunteered to help or were asked by the organizers. This was good for the spirits and morale of the evacuees because it gave them something to do besides sit around waiting to hear when they could go home. It worked best in Centres with clearly defined co-ordination and with numbers small enough for a sense of community and identity.

The importance of individual volunteer effort is perhaps best illustrated by the case of the Vic Johnston Arena and Recreation Centre in Streetsville. Although the Red Cross had a person there, the Centre was basically organised and run by four women from the local Minor Hockey Association's Women's Auxiliary, who were experienced in running functions at the arena. One ran the kitchen and food service; one manned the phones; one, a nurse, looked after health care; and the fourth organised the other operations of the Centre. They used their contacts in the community very effectively to get food and other necessary supplies, and recruited volunteer assistance from the community and the evacuees themselves. Except for a nursery upstairs, everyone was in one large room, but numbers were small (about 100 at the peak) and a real sense of "family" developed. Evacuees were very grateful for the care they received.

#### 4.3.10. Consolidating the Centres

The numbers of people in the Centres declined after the Sunday night peak. Some evacuees found places to stay with friends or relatives. Others took the offer of billets in homes in the local community. On Tuesday, many were able to return to their homes. As the numbers in the Centres declined below a certain level, it was decided to consolidate the evacuees into the larger Centres (Table 4.1). This also took some strain off the volunteer effort which began to wane over time as people felt increasing pressure to return to work or were tired out by their efforts.

The first reduction occurred on Sunday night, when evacuees at W.J. Fenton Vocational School in Brampton were moved next door to J.A. Turner Secondary School. The Red Cross and school administrators had set up a very effective billeting system in both these schools which was able to place hundreds of evacuees in private homes as soon as they arrived. This allowed them to comfortably put the remaining evacuees all in the one school. It is interesting to note that this was the only case in the emergency when billeting worked well. At other Centres, there were many offers of homes, but few people were willing to accept them. The only obvious difference at Fenton and Turner was that people were placed right away before they "settled" in the Evacuation Centre. The Red Cross estimated that 1600 people were billeted and 950 homes were offered.

On Monday morning, the people placed in Dolphin Senior Public School in Streetsville were returned to Streetsville Secondary School. Dolphin was opened under the efforts of the local municipal councillor without consultation with the Board of Education or the school principal, who was surprised to arrive at work on Monday to find 40 evacuees in

his school. The Board would have refused the use of the school because its desks and chairs are too small to accommodate adults comfortably.

At various times on Tuesday, 13 November, the remaining evacuees at Turner, Westwood and Morningstar Secondary Schools and at the Vic Johnston Arena, were taken to Streetsville Secondary School because of reduced numbers. Attempts had been made to keep some of the schools open on the Monday, but this had been difficult for school staff to handle, and added to the impetus to reduce the number of Centres. Streetsville Secondary School remained closed for classes until evacuees were gone, as did the two Sheridan College campuses. Brampton Centennial School was open for classes from Tuesday on and was able to cope with both activities at once. In the case of the 101 Legion Hall in Etobicoke and M.M. Robinson Secondary School in Burlington, the evacuees they sheltered were all from the areas reopened on Tuesday, and they closed by Wednesday morning.

By Wednesday, there were only 5 major Centres still operating: the two Sheridan College campuses, the International Centre, Streetsville Secondary School, and Brampton Centennial Secondary School. Mayor McCallion decided that "her people" should be moved to hotels for that night, so Tom Huntley and representatives from CP Rail, Mississauga Public Relations and Mississauga Transit, worked out a plan to move the evacuees to hotels in and around Toronto, with CP Rail picking up the bill.

On Wednesday afternoon, the evacuees in the 5 remaining Centres were re-registered and the names sent to CP Rail, who allocated people to available hotels. On Wednesday evening, 14 November, buses were sent to the Centres to pick up the

evacuees. They were not told where they were going, and they were not allowed to take their cars because of a concern that only registered evacuees have access to hotel accommodation. Those wishing to have their cars were able to return on the bus and pick them up after checking into the hotel. This arrangement irritated many of the evacuees, particularly because they had already registered their names, so that, presumably unregistered people could not get into hotels anyway. Some thought they were going to the International Centre about which they had heard negative reports. The situation was further complicated when someone told the news media of the hotel accommodation plan, and it was broadcast to the public late Wednesday afternoon. People in billets and paying for hotels gave up their accommodation and rushed to the Centres (primarily to the International Centre) to get free hotel accommodation. In most cases, they were refused.

It became necessary to keep the International Centre open for these people, and others who had to give up their existing accommodation due to lack of funds or some other reason. About 100 people remained at the International Centre until it closed on Friday evening with the reopening of the last evacuated area.

Estimates of the number of people taken to hotels were from 800 - 1000. Red Cross volunteers accompanied evacuees to hotels to assure that their needs were met. On Friday night, 25 - 35 handicapped and elderly people at the International Centre were taken to the Travelodge Hotel, so that they could be comfortably returned to their homes on Saturday, with Red Cross assistance.



#### 4.3.11. The Centres: Some Case Studies

The overall operation of each Evacuation Centre was done with varying degrees of success. Three important factors determining this were the adequacy of existing facilities in the Centres, the degree of organisation and effective overall co-ordination of the Centre, and the number of evacuees sheltered relative to the availability of facilities and quality of organisation. Other factors such as adequacy of food, other supplies and manpower are important, but were generally not a problem in this emergency. The three factors can be clearly illustrated by looking at the operations of specific Evacuation Centres.

The International Centre, which sheltered the largest number of evacuees for the longest time, was, ironically, the poorest of the facilities used. Although the Peel Police had it on its list of possible Evacuation Centres, the Social Services' list of centres, which favours schools and recreation centres, specifically recommended against using the International Centre because its existing facilities are poor for this use.

It basically consists of two large rooms. The one that was used in this emergency has a cement floor which was very cold to sleep on, particularly as food and other supplies were constantly coming into the building. The large service doors, which open into the room, were frequently open, letting in cold air. Washroom facilities were inadequate for the number of people at the Centre for the first three days, and there were no showers. There were no separate rooms for eating and sleeping, medical care, a nursery, a quiet room for those needing privacy, or a recreation room for children. Everything had to be done in the one room, with the echoing P.A. system making constant announcements in the background.

There were no gym mats or other materials that people could sleep on, compounding the problem of the cold floor. Old people and mothers with young children were given long bingo tables, their legs folded, to use as "beds", but this deprived others of tables at which to sit. There were no kitchen facilities or refrigeration for the food that poured into this Centre.

Although a lot of volunteer effort, particularly by the Scouts, got the Centre into operation, there was no effective co-ordination set up by the Red Cross until Monday. This added to the confusion experienced by the evacuees and the workers.

There was also some friction between the Boy Scouts and the Red Cross; early on, the Scouts perceived themselves in charge, and resented the Red Cross for taking over operations later on. This friction occurred in several situations during the emergency and is a reflection of the lack of formal agreement among volunteer and government agencies about which agency has a mandate to co-ordinate emergency services and what the responsibilities of each agency should be. It was also exacerbated by personality clashes between highly motivated volunteer leaders who were perceived as "taking over" operations and being "in charge" rather than performing a co-ordinating role, with responsibilities assigned and agreed upon among the agencies involved. These incidents were not serious, and were ironed out after discussion and agreement.

Streetsville Secondary School, despite having excellent facilities, including a very large, well equipped kitchen with a large refrigeration capacity, experienced some problems as a Centre. Most of these were in organisation.

This Centre received busloads of evacuees from Square One before it was properly set up. Not all people were

registered as they came in so that local youths were able to get into the Centre, looking for some fun, and no one knew that they were not evacuees. Subsequent problems with drinking, fights and some vandalism, necessitated bringing in the police. This was unnerving to some of the evacuees and created a strain on those running the Centre.

It was never clear to the evacuees who was running or co-ordinating the Centre. The Red Cross were supposed to be the co-ordinating agency, but a group of Cadets operated pretty much on their own performing "crowd control" and the local municipal councillor, the school staff and the Salvation Army were also very much involved in running things. This confusion was compounded by the fact that the Streetsville Centre was the "co-ordinating" Centre for the other Evacuation Centres, as much as there was one. Much of the energy and focus of those in charge was on moving evacuees through Streetsville Secondary School to other Centres on Sunday, moving them back again on Tuesday, and moving food and other supplies via the Streetsville Centre to other Centres which needed them. In general, however, the Centres had to look after their own requirements for food, supplies and manpower.

Streetsville Secondary School also housed a large number of evacuees - estimates range as high as 1100 at the peak - which, under the circumstances, added to the evacuees' confusion. Those performing "crowd control" (basically keeping the halls clear) caused some irritability in the evacuees, who felt that the "policing" was over-zealous. There were no problems with crowd control reported at any of the other Centres. Moving busloads of evacuees from other Centres back into the existing situation at Streetsville Secondary School on Tuesday added to the confusion, and was hard on those coming in who had been very comfortable at the

Centres they had left.

How much of this situation was caused by the sheer number of people at Streetsville Secondary School is hard to say. If the organisational problems had not been there, Streetsville Secondary School might have comfortably sheltered the numbers that it did. The evacuees at Streetsville Secondary School were well looked after. The problem for them, and the workers, was the confused, chaotic and somewhat alienating atmosphere, where the evacuees did not feel at home.

The other major Centres did not experience the problems of the International Centre and Streetsville Secondary School. They had adequate facilities. They were well organised, with one agency, either the Red Cross or St. John Ambulance, co-ordinating operations. There was no friction reported between agencies. At Brampton Centennial Secondary School, the Red Cross arrived several hours after the Centre opened. Their team leader could see that, despite a tremendous volunteer effort by various groups and individuals to set up the Centre, some co-ordination was needed. He called together the other volunteer leaders and offered to co-ordinate the Centre, explaining that the Red Cross was trained to do this. The others agreed, responsibilities were delegated, and the Centre ran like clockwork from then on.

Whenever possible, evacuees were encouraged to be involved in running the smaller Centres, which boosted morale and spirits, and helped create a "family" atmosphere. Although the numbers varied in these Centres from fewer than 100 up to 500, there were never more people than the facilities could handle. In general, the smaller the number, the greater the "family" feeling, but in most cases, the evacuees were as comfortable as they could be under the circumstances, and

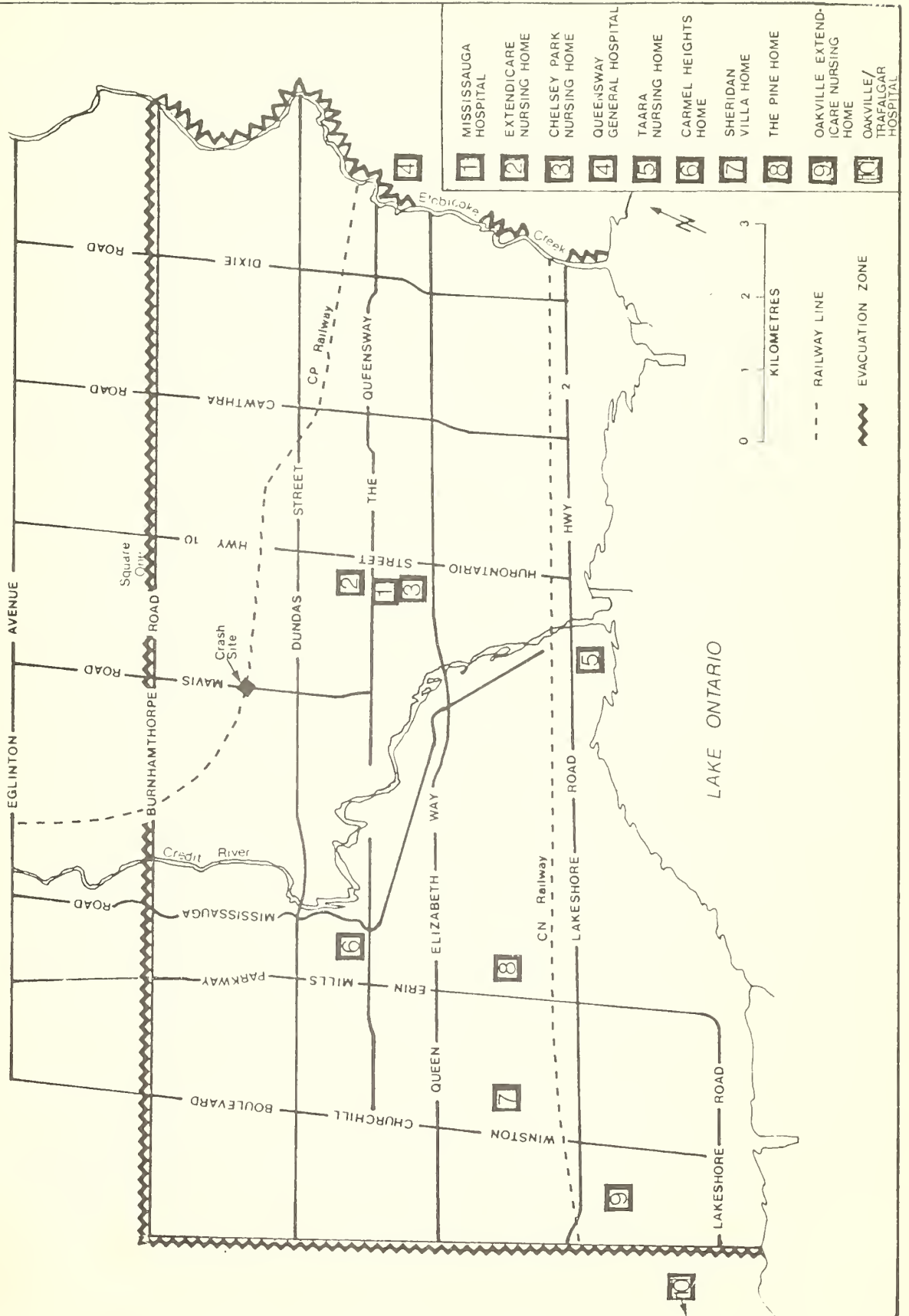
grateful to the people who looked after them. This made the work of the volunteers more rewarding and enjoyable. One advantage of smaller numbers is that if there is a serious health problem, it can be more easily contained. The scarlet fever cases at the International Centre required the temporary quarantine of over 1000 people.

Some volunteer leaders were resentful about "their people" having to leave for another Centre during the consolidation on Tuesday, 13 November. On Wednesday night, the buses came very late (after 23:00) to take the evacuees from Sheridan College, Oakville, to hotels. Many evacuees wanted to stay until the morning and the President of the College refused to have them bussed that night if they did not want to go. Many evacuees expressed genuine regret at leaving these Centres, even when they could return to their own homes!

#### 4.4. PEOPLE IN INSTITUTIONS, GROUP HOMES, OR RECEIVING SPECIAL CARE

Among the people evacuated during the emergency were individuals living in institutions and group homes, or receiving some kind of special care in their own homes from health or social service agencies. In most cases, those in institutions and group homes had to be evacuated by those responsible for them and they had to be provided with alternative shelter and care. Those receiving special care in their homes were generally evacuated by families, but needed access, where they went, to the services they normally received at home. The locations of institutions that were evacuated are in Figure 4.3.

FIGURE 4.3 LOCATIONS OF INSTITUTIONS EVACUATED





#### 4.4.1. Psychiatric and Extended Care Hospital Patients

The evacuation of hospitals has already been described. However, two groups of patients were discharged from the hospitals at the time of the evacuation, some of whom needed care out of the hospital. Anticipating an evacuation of only a day, the Mississauga Hospital told psychiatric patients out on weekend passes to stay at home, and sent other psychiatric patients home at the time of evacuation. Most of these patients were subsequently evacuated from their homes. Because there was no health communication system operating, they were unable to contact their doctors to get psychiatric care if they needed it. Some of them had difficulty coping for the whole week.

Some of the patients in Mississauga Hospital were also sent home to their families. Out of concern for their needs at home, the Home Care Co-ordinator<sup>1</sup> for Mississauga General, June Morley, came to the hospital, on her own initiative. By the time she arrived, some of these patients had already been discharged. For the rest, she arranged Home Care or Public Health Nursing,<sup>2</sup> as required. Unfortunately, most of

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<sup>1</sup> The Home Care Program is run by the Peel Regional Health Unit to provide short term care for discharged hospital patients who require physical nursing, physiotherapy, or homemaking. Physical nursing services are purchased from the Victorian Order of Nurses and the St. Elizabeth Nurses; homemaking from the Red Cross. People requiring long term care of this nature either receive a subsidy from Peel Social Services or pay themselves, often through private insurance.

<sup>2</sup> Public Health Nurses from the Peel Regional Health Unit provide home service to discharged hospital patients and others in the community who require teaching or counselling (for example, pre-natal counselling, or monitoring medication for seniors). The Public Health Nursing liaison person was not at the hospital during its evacuation, so June Morley had to look after this function, as well.

them were subsequently evacuated. Those that phoned the Home Care Office of Peel Regional Health were referred to services in the community to which they had gone; the others could not be reached.

#### 4.4.2. Residents of Nursing Homes and Homes for the Aged

Residents of three nursing homes and three homes for the aged were evacuated from Mississauga, and residents of one nursing home from Oakville (Table 4.3).

Nursing homes, which are privately owned and are licenced by the Ministry of Health, were ordered evacuated by the Control Group, or the Halton Police Chief, in the case of Oakville Extendicare. The homes were asked to prepare their residents for evacuation. Residents were identified and their medical records and medication were sent with them. The ambulance service and transit buses, in one case assisted by vehicles from St. John Ambulance and the Red Cross, moved people to nursing homes, hospitals, and homes for the aged in the communities around Mississauga. Staff assisted in loading residents into the transport, and accompanied them to their destinations. There were no plans that required staff to call in to the homes when they heard about the emergency, although many did. Others were contacted and called in by the administration. While evacuated, residents were looked after by their own nursing home staff, staff from receiving institutions, and, in some cases, nurses brought in from private agencies. The same staff assisted the return of the residents by bus and ambulance, when the nursing homes were reopened.

Homes for the Aged in Peel Region are the responsibility of the Regional Social Services. Although their

Table 4.3 Nursing Homes and Homes for the Aged Evacuated

<u>Home</u>	<u>Location</u>	<u>Evacuated</u>	<u>Returned</u>	<u>Where and Numbers</u>
Mississauga Extendicare Nursing Home	Mississauga	10:00-12:00	Sunday, November 19	170 to E.C. Drury School for Deaf in Milton 23 heavy care to West Park Hospital, Toronto 9 home with families
Chelsey Park I Nursing Home	Mississauga	11:00	10:00 Saturday	54 to Chelsey Park, Streetsville (heavy care people) 78 to <b>Tullamore Nursing Home</b> , Brampton 78 to Cheltenham Nursing Home, 5955 Bathurst St., Toronto 26 to <b>families</b>
Taara Nursing Home	Mississauga Road and Lakeshore	18:00-19:00	Friday evening	53 to Home for Aged in Toronto (Cummer House, Fudger House, Castleview Towers) 2 to families
Carmel Heights Home for the Aged	Dundas West and Mississauga Rd.	20:00-21:00	17:00 Friday	49 to E.C. Drury School for Deaf 22 to families
Sheridan Villa Home for the Aged	Mississauga	21:00-23:00	18:30 Tuesday	122 to Peel Manor Home for Aged, Brampton 67 to Peel Memorial Hospital, Brampton (heavy care) 19 to Knightsbridge Senior Citizens Centre, Brampton 38 to families
The Pines Home for the Aged	1231 Sayers Road	23:00	14:00 Saturday	20 to Kipling Acres, Toronto 20 to families

Nursing Homes and Homes for the Aged Evacuated (cont'd)

<u>Home</u>	<u>Location</u>	<u>Evacuated</u>	<u>Returned</u>	<u>Where and Numbers</u>
Oakville Extendicare Nursing Home	Oakville	01:00 Monday	18:00 Tuesday	132 to Hamilton Psychiatric Hospital 39 to Joseph Brant Hospital, Burlington (heavy care) 20 to families

evacuation was ordered by the Control Group, the responsibility for organizing the evacuation rested with Commissioner Crozier and his senior staff, including the administrators of the homes. Staff were called in to assist (again, there was no plan that required staff to call or report in during an emergency).

Residents of Homes for the Aged, who are generally in better health than nursing home residents, were moved primarily by bus or car to receiving institutions arranged by Social Services (Table 4.3) except for some "heavy care" people at Sheridan Villa who were taken to Peel Memorial Hospital by ambulance. The Villa received assistance from Scouts, the Lions Club, and neighbours in carrying out the evacuation. The Pines received help from Social Services staff and the neighbourhood fire department. Carmel Heights, which is run by the Carmelite Sisters, was evacuated by the Milton Optimists. Their President, Joe Barrett, who had been an administrator in senior citizens' services for Peel, contacted the home to offer help. He arranged for 25 of his club members to provide transportation for the residents by car to the E.C. Drury School for the Deaf in Milton. They brought the seniors home again at the end of the week.

Because Peel Regional Health and the Social Services are involved in providing nursing care to people in their homes, there were contacts between the Director of Nurses, Wynn Burrell, of Peel Regional Health; the Social Services, including administrators of the Homes for the Aged; St. Elizabeth Nurses; and District Director of the Peel Victorian Order of Nurses, Bonnie O'Neill. In the absence of an emergency plan, these contacts facilitated communication between these organizations to identify and provide nursing services where needed. Both Victorian Order of Nurses and Public

Health Nurses were sent to help the regular staff looking after Sheridan Villa residents, and to assist in their return. Similar contacts in Halton led to their Public Health Nurses assisting at the E.C. Drury School in Milton.

#### 4.4.3. Residents of Group Homes and Institutions

Several group homes and institutions were evacuated in Mississauga and Oakville (Table 4.4). In all cases, the evacuation was carried out by the staff of the responsible agency. Residents of the group homes (Mississauga Childrens' Aid Society and Mississauga and Oakville Associations for the Mentally Retarded) were taken to the homes or cottages of staff, or were looked after by their families. The two large institutions (Syl Apps Training Centre and Oaklands Regional Centre for the Mentally Retarded) took their residents to similar facilities elsewhere.

In all but two cases, there was no pre-planned procedure for contact between staff and the responsible agencies, and there was no agency that had instructed families to contact them in case of emergency. In this emergency, most of the staff either phoned in on their own initiative, or were contacted, and families were able to contact, or be reached by, the 'agencies. In the latter case, this was made easier because the agencies' headquarters were not evacuated.

#### 4.4.4. People Receiving Special Care in Their Homes

The agencies providing special care in the home were unable to provide this during the evacuation, or contact their clients. Many of these people phoned the Victorian Order of Nurses or the Home Care Office and were referred to the appropriate service in the community to which they had evacuated. Special care people depended on their families to be evacuated from their homes.



Table 4.4 Institutions and Group Homes Evacuated

<u>Name and Number Evacuated</u>	<u>Location</u>	<u>Evacuated</u>	<u>Returned</u>	<u>Where Taken</u>
Children's Aid Society - 3 homes ( 20) - Foster homes (500)	Mississauga Mississauga Mississauga	Sunday Sunday	As area reopened	Homes and cottages of staff With foster parents
Mississauga Association for the Mentally Retarded - 3 Group Homes (26)	Mississauga	Sunday	Friday	To Brampton Group Home, with family, or to staff homes
- apartment living program (18)	Mississauga	Sunday	Friday	With family or to evacuation centres
- Brampton Group Home (17)	Brampton	Monday	Wednesday	Staff in Toronto (including evacuees from Mississauga homes who went to Brampton)
Oaklands Regional Centre (150) (Retarded)	Oakville (near Trafalgar Rd. & Lakeshore)	01:00 Monday	Wednesday A.M.	Three facilities in Hamilton and Vineland
Oakville Association for the Mentally Retarded - Group Home (12)	Oakville Central Oakville )	01:30 Monday	Wednesday afternoon	Staff homes in Milton, Burlington, West Oakville
- Apartments (19)	Throughout Oakville )			
Syl Apps Training Centre (50)	Oakville-Trafalgar Gar Rd. & 8th Line	01:20 Monday	Tuesday evening	Sprucedale School in Simcoe

#### 4.5. EMERGENCY PERSONNEL

The hundreds of people working at the accident site - police, firemen, the EOCG, government and industry officials - and the police manning the perimeter of the evacuation and patrolling the empty city, had to be provided with food and hot drinks throughout the week.

##### 4.5.1. Food Services

Peel Regional Police contacted Captain Robert Ratcliffe and requested that the Mississauga Salvation Army set up a mobile canteen near the accident site, very early on Sunday morning, 11 November. Their operation expanded during the day on Sunday to the provision of food to police Command Post number 2 at the Westdale Mall, on Dundas St. W. at Wolfedale Road (moved on Wednesday to Sheridan Mall). This operation continued all week. On Monday, after the boundary of the evacuation area had expanded, it became necessary to take food and hot drinks out to the police on point duty, as well.

The Salvation Army had 3 teams of 50 volunteers carrying out this operation from Monday, 12 November, on. They either made the food at their Cawthra Road Temple, or purchased it from restaurants. On Monday, when the Temple was evacuated for a day, the Etobicoke Temple became the centre of operations. The Salvation Army served 20,660 meals during the emergency. They were reimbursed from their National Emergency Fund.

At 11:00 Sunday, the North York Branch of the Red Cross arrived at the accident site itself with a mobile canteen. Within hours, they had opened the cafeteria of the Bell Building to feed the people at the site. They continued this

operation until the following Sunday afternoon on a 24 hour basis.

At first, the Red Cross either arranged for food from restaurants, particularly donations from McDonald's, or it was donated by churches. By Sunday evening, they were bringing food from the Evacuation Centres, particularly the Streetsville Secondary School. On Tuesday night, the Salvation Army began to bring in food to the site for the Red Cross to serve. The Red Cross looked after "between meal" feeding and beverages. Extra food was sent back out to Evacuation Centres that needed it. Six hundred meals were served "per sitting", including those served to police on the perimeter.

There were some problems in this feeding operation, stemming from confusion about who was responsible for what tasks. The Red Cross thought that they were also responsible for feeding the police on the perimeter. When the Salvation Army began to bring food in to the site, some of it was diverted to the perimeter, so that there was not enough for the people at the site. The Salvation Army were getting calls for more food when they were sure they had delivered enough. This caused some confusion and tension until Tom Huntley, of the Red Cross, Capt. Ratcliffe of the Salvation Army, and a police sergeant at the site sat down and came to an agreement that the Salvation Army would obtain and deliver the food, and the Red Cross would serve it at the site only.

The feeding operation was further confused early in the week when an over-zealous volunteer, representing himself to the Red Cross as a CP employee, said that he would arrange to provide food to the site. The Red Cross did not check out his credentials. He set himself up in a hotel and began to

order food to be delivered to the Red Cross at the site, charging it to CP Rail. Too much food started coming to the site. Suppliers, suspicious of the way the food was being ordered, alerted CP Rail, who quickly tracked him down and stopped his "operation".

#### 4.5.2. Health Care

Although the Brampton St. John Ambulance set up a first aid post early Sunday morning, it was decided, because of the danger, to ask them to leave, and not to have health care facilities on-site.

### 4.6. EVALUATION

The community needs of the people evacuated in this emergency were, generally, very well met. The magnitude of the response was almost overwhelming in most of the areas for which it was required. What problems there were, did not have extremely serious consequences for the evacuees, and could be remedied in the future by improved emergency planning.

Within the many groups meeting community needs, there were varying degrees of organisation, sometimes specifically geared to emergency situations, and sometimes not oriented to emergencies but useful in this context.

Between these organisations, beyond informal contacts developed through work or previous experience in emergencies (usually at the municipal or regional level), there was no pre-planned, organised system of interaction. This led to some inconsistency in the adequacy of services offered and

some confusion, even friction, about who was "in charge" and what roles each was playing. The problems that resulted did not create any serious consequences for the evacuees but did, in some situations, create discomfort and difficulty for the organisations involved.

Between the Control Group and the organisations responsible for community needs, there were serious communication and organisational problems. The authorities were concerned with getting the people out safely and removing the danger. Once people were evacuated, there was no one person or agency in either group, under any emergency plan, which had responsibility for making sure that all community needs were being met. The Control Group did not ensure that such a person or agency was appointed during the emergency. Needs were met because certain organisations took responsibility on their own initiative. Where no initiative was taken, the need was not met. There was also limited feedback from these organisations to the Control Group.

Some people stayed in Evacuation Centres rather than go to hotels because they thought they might be going home at any time - this meant more services were required to look after evacuees. Those planning for the needs of the evacuees, particularly at the Centres, had to plan in advance. Thinking that the evacuation might be lifted at any time, complicated this planning process.

The choice of the International Centre as an Evacuation Centre was a poor one because it has inadequate facilities for this function. The choice would not have been made had the Peel Regional Social Services' list of potential Evacuation Centres been used.

Finally, the decisions in the early hours to use facilities close to the accident site as Evacuation Centres, led to the re-evacuation of 3 Centres. Some people were moved

twice, from Square One to Sherway Gardens and then on to a third Centre. This confused the registration system for evacuees, and meant that large numbers of evacuees arrived all at once at one Centre, overloading the registration system and causing organisational problems later. These early Centres were chosen before the geographical context of the danger was understood.





## **Chapter 5**

# **PUBLIC RESPONSE TO THE EVACUATION**



5.1. INTRODUCTION

This chapter is concerned with the public response to the emergency, and in particular, how the public evacuated Mississauga. Using both survey data and information gathered from many personal interviews with evacuees, the chapter seeks to document how nearly a quarter of a million people left their homes within one day. It remains an achievement for the people of Mississauga as well as for the authorities; 95% of the evacuees found their own accommodation and made their own travel arrangements. They were out of their homes for periods ranging from 1-8 days with staying away for 3 days or more (Table 5.1).

Table 5.1. Number of days evacuees stayed away from home

AWAY FOR:	<u>Number of households</u>	<u>Percent</u>
1 day <sup>1</sup>	450	< 1
2 days	14,000	19
3 days	24,200	32
4 days	8,000	10
5 days	10,600	14
6 days	12,800	17
7 days	5,000	7
8 days	<u>450</u>	< 1
Total	75,500	

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<sup>1</sup> Not necessarily the first day of the evacuation.

The accident took place at midnight on a Saturday so that most families were together, and at home, when they were asked to evacuate. Over 70% of the households surveyed had all their members together when the accident happened. The timing of the evacuation on a Sunday, and the fact that most people who live in Mississauga work outside the city, meant that the majority of people had to evacuate their home rather than their workplace (Table 5.2).

Table 5.2. Places from which people were evacuated

	<u>Number of households</u>	<u>Percent</u>
Home	63,500	84
Workplace	1,500	2
Both home and work	9,500	13
Stayed inside evacuation zone	<u>1,000</u>	<u>1</u>
Total	75,500	100%

Although the majority of evacuees left Mississauga until they were allowed to return, a few people deliberately stayed behind (Section 5.6) and many more tried to re-enter the closed city (Section 5.7). Two other groups had different experiences from the other evacuees; people using the Evacuation Centres (Section 5.5), and people living on the edge of the evacuation zone (Section 5.8).

#### 5.1.1. Convergence on the accident scene

Within minutes of the accident, many people rushed to the scene. Those who lived within a few blocks ran

Going to see the accident.....

Mr. and Mrs. R. and their children, a son aged 15 years and a daughter aged 10 years, live only 2 miles from the accident site.

When they saw the explosion, they thought at first it was a gas station or a chemical factory blowing up. Then they thought of the railway line. They did not feel or hear the explosion, although they heard later that it could be heard as far away as Bathurst and St. Clair. The windows in their home did not even rattle. But they saw the explosion. Mrs. R. thought that she could smell something and became scared. Mr. R. and his teenage son set off to investigate the flames. The traffic was very bad. Mr. R. describes what happened.

"We got up to Mavis Road where the lights are and we were stopped there. I stopped there. The cars were all stopped. There were cars parked on both sides of the road with people standing in groups. We rolled down the window and this huge ball, fire, went up in the sky. It was actually quite magnificent and it lit up everything. And the heat.....you could feel the heat from it. It didn't shake the car or anything, though. As it went out, the whole sky was quite black and you could see all these sparkles just coming down."

At the time, Mr. R. thought that a train had hit a truck carrying gas. He could not get any news on his car radio and he could not turn around because of the traffic. He drove on westwards away from home. By 1:15 A.M., the news finally started to come through on the car radio and Mr. R. and his son were still trying to negotiate traffic jams and closed roads to get back home. It took them 1-1/2 hours to drive the 2 miles.

Meanwhile, recalls Mrs. R.,

"Here I am pacing the floor, wondering why its taken them so long to come back from the so-called "fire".....until I heard that it was an actual explosion and then I was really petrified".

Reunited, the family retired to bed.

Living close to the accident site.....

Mr. and Mrs. B. were at home when the accident occurred. Their 12 year old daughter was asleep in bed. When the train derailed, everything went black for an instant, then the flames shot up and the heat became so intense they thought they were going to burn right in their home. They shut the door against the heat and heard their daughter wake up. Mr. B. went outside to see what was happening.

He got as far as the railway tracks and found that it was a derailment. There were already lots of people there. When they thought it would blow again, everyone began screaming and running away. People were tripping over one another. At the second explosion, Mr. B. thought that his clothes were on fire. He ran furiously home to find his wife and daughter in tears. They were terrified by the explosion but he told them it was just a propane car exploding and that seemed to calm them down a bit.

As the flames quietened down, they all went upstairs to go to bed. It was 2:30 A.M. when the police knocked on the front door and told Mr. B. to leave as fast as they could. They were told not to make any preparations and were not told about the chlorine gas. They all left immediately and went to Square One Evacuation Centre. It was 2:45 in the morning.

Mr. B. didn't consider leaving before the police asked him because he didn't know about the chlorine and the flames seemed to be dying down. In any case, there were so many cars and people, it would have been difficult to get out. Some neighbours did leave straightaway after the third blast, before the police came round.

Mr. B.'s house was damaged with cracks in the roof and inside walls. Although the CP Rail inspectors came and wrote down things, he has never heard from them. Afterwards, he was afraid to eat the vegetables in his garden but the government department told him that they were safe to eat. He doesn't really have any anxiety now although he is more concerned about trains going by with dangerous chemicals. They haven't considered moving although they might, if they lived right next to the tracks.



towards the accident while hundreds of others living farther away, got in their cars and drove there. Some of the eye-witness accounts are in the evacuees' own stories, which are included in the report.

The majority of the onlookers were probably men. When families heard the first explosion and saw the flames, it was often the father and older boys who went to see what was happening. Mothers, girls and younger children stayed at home. Many had to wait an uncomfortably long time for the onlookers to return and endured their most anxious moments during the whole emergency.

The number of cars converging on the accident site produced large traffic jams. People could not turn round in the road to return by the same route by which they had come and families near the site had trouble leaving. When the second and third explosion occurred, hundreds of onlookers ran away, screaming. At the time, these people did not realise the danger of poisonous gas inhalation to which they were exposing themselves. In retrospect, they felt frightened and today say that they would not rush so close to unknown dangers again.

Thus, for some evacuees, the experience was a salutary one. They have learnt not to assume that a fire is simply a fire. It is likely, however, that in other emergencies, people will still converge on the accident scene.

## 5.2. PUBLIC RESPONSE TO THE EVACUATION ORDER

### 5.2.1. Initial Preparations

As the evacuation zone widened, people began to anticipate that they might have to evacuate their homes.

However, the majority (65-70%) made no preparations at this time. Less than 5% made arrangements about emergency accommodation before they were officially told to leave, and about 15-20% started to pack suitcases. Among those who did start to collect their belongings were families who knew that it would take them longer than for others because they had children or older people needing special assistance.

For most families, the time between the accident and when they were officially told to leave was not spent preparing to evacuate. This was partly because people did not expect that they would need any overnight belongings. They did not expect to be away for more than a few hours (Table 5.3).

Table 5.3. Expected length of evacuation by whether households made plans to be away

	<u>Made plans</u>	<u>No Plans</u>
	%	%
<u>Expected to be away:</u>		
Less than one day	7	83
More than one day	7	3
N = 555		

People largely spent the time listening to news broadcasts on the radio and television, and discussing the situation with family and neighbours. Many contacted friends and relatives by phone, or were called by them (Section 5.9).

### 5.2.2. The search for accommodation

Once they knew that their home was in an official evacuation zone, families began to discuss where they should go. For the 4,000 households that were evacuated without warning while it was dark early on Sunday morning, the decision was made rapidly while the police waited at the door. Some went initially to Square One Evacuation Centre and there discussed where to go. Other evacuees usually had, or took, a little more time. The decision was almost always arrived at after a family discussion of the alternatives. The factors involved in the selection of a private home destination included:

- (a) whether they had received an invitation to stay;
- (b) how far away it was;
- (c) how comfortable they felt in "imposing" on the family;
- (d) how appropriate the size and facilities of the accommodation were for their needs; in particular, whether they could all go together;
- (e) (for those with pets) whether they could take pets with them;
- (f) (for a few only) its location with respect to their workplaces.

People who chose to go to hotels as a first destination tended to be those who could afford it and/or who expected that someone would have to compensate them. They would make telephone arrangements with a hotel that they knew by name, or had visited before. They took an overnight suitcase. Other people made no advance arrangements but simply kept driving until they found an empty room.

The people who went to Evacuation Centres did so for a variety of reasons. Some had no relatives or friends they felt they could stay with; some could not afford hotels or

could not take their pets there; some were taken to the Centres and once there, many thought that they could not leave. This included some senior citizens living alone. Younger people, especially teenagers, wanted to go to the Centres to be "with the crowd and to have a good time". Not all of these people went directly to an Evacuation Centre - some had tried without success to find private accommodation first and had "ended up" at the Centres.

Whatever the type of accommodation sought, it appears that two important elements in the choice were that:

- (a) the household would remain together;
- (b) the evacuation was expected to be for only a few hours, or at most, overnight.

#### 5.2.3. Time delays in leaving home

The official evacuation zones were declared throughout Sunday, November 11, starting at 01:47 and ending at 23.30. Table 5.4 gives the population that had to be evacuated at each time.

Most families responded rapidly to the evacuation order; 50% left within half an hour of their zone being declared (Figure 5.1); within one hour, 80% of the evacuees had left. A few people took much longer - up to several hours - but this occurred with only 5% of all households.

The speed with which the public responded was influenced by the time of day when they received the order. Families in the first zone who were asked to leave within two hours of the accident at 01:47 responded the most rapidly. Those who could (more than 60%) had left their homes within 15 minutes. Another group took between 45 minutes and one hour to leave. Within one hour, 90% of the houses in the

The search for shelter.....

Mr. and Mrs. M. live with their 20 year old son in a two bedroom apartment in an old apartment block. Mr. M. is not very well and they only just manage to make do financially.

They saw the fire from the apartment window. They could see the flames. Mrs. M. called to her husband to look and he got to the window just in time to see the explosion. It was awe inspiring. Mrs. M. recalls, that she saw some things during the war, but never anything like this. There was a mushroom cloud. Mr. M. was only worried that the fireball was not blue (a nuclear blast).

They tried to get information. It was difficult. Mrs. M. was switching from one radio channel to another. They turned on the T.V. but still could not find out what it was. Sirens were going by along Highway 10 where they lived. Mrs. M. stayed up until 4:00 A.M. when she heard that it was the railroad. When she went to bed, there was still no talk of an evacuation.

At eight o'clock on Sunday morning, Mrs. M. got up to do the chores. She was dressed only in her work-around-the-house clothes. Soon afterwards, a knock at the door revealed "a great, big, gorgeous cop, who grins and says 'Out!'. Nothing more."

Mrs. M. didn't argue. She grabbed the cat, his harness and her purse. The three of them left with the cat for a friend's apartment located a mile to the south-east of them. They thought that they would be safe there.

As it turned out, they were soon re-evacuated as the perimeter widened. Mr. and Mrs. M. decided to go to another friend's apartment in the east of Mississauga. It took two trips in the car to move everyone. They had only just settled in when they were evacuated a third time. They had nothing with them, except her purse and some cat food they had managed to buy on one of the car journeys. They realised by now that they were going to be out of their home overnight.

Everyone decided to stay with some relatives of (the second set of) friends. They were all made welcome, but their host's two children were highly allergic to Mrs. M.'s cat so that the couple could not stay.

Continued. . .



Mr. and Mrs. M. went out and sat in their car, and wondered what to do. They couldn't afford a hotel and couldn't think of anywhere else to stay. On the car radio, they heard that the International Centre was just opening.

At the door of the Centre, they had an argument about getting the cat in with them. This surprised Mrs. M. because when they did get inside, it was like Noah's Ark with animals and children running all around.

Two days later, her husband was feeling sick. It was cold in the Centre because the delivery doors were often open. When someone came and offered them private accommodation, they accepted gratefully.

It was to be their fifth, and final, evacuation shelter in three days. They returned home on Thursday. By sheer chance, they heard a commentator on the radio observe how strange it was to see business as usual on one side of Highway 10 and everything deserted on the other. They realised that they could go home. Mr. and Mrs. M. returned to an almost deserted apartment block.

For a while after the emergency, Mrs. M. was very nervous about things, especially whenever she heard a siren. Today, she is not afraid for her health or safety as much as the idea of having to go through it all again. In the long term, she thinks the experience has made them all appreciate the cat more. He was very well behaved even though he had never been outside the apartment before.

Perhaps they are more fatalistic - having been through the war - but you just have to learn to accept things. It may happen again.

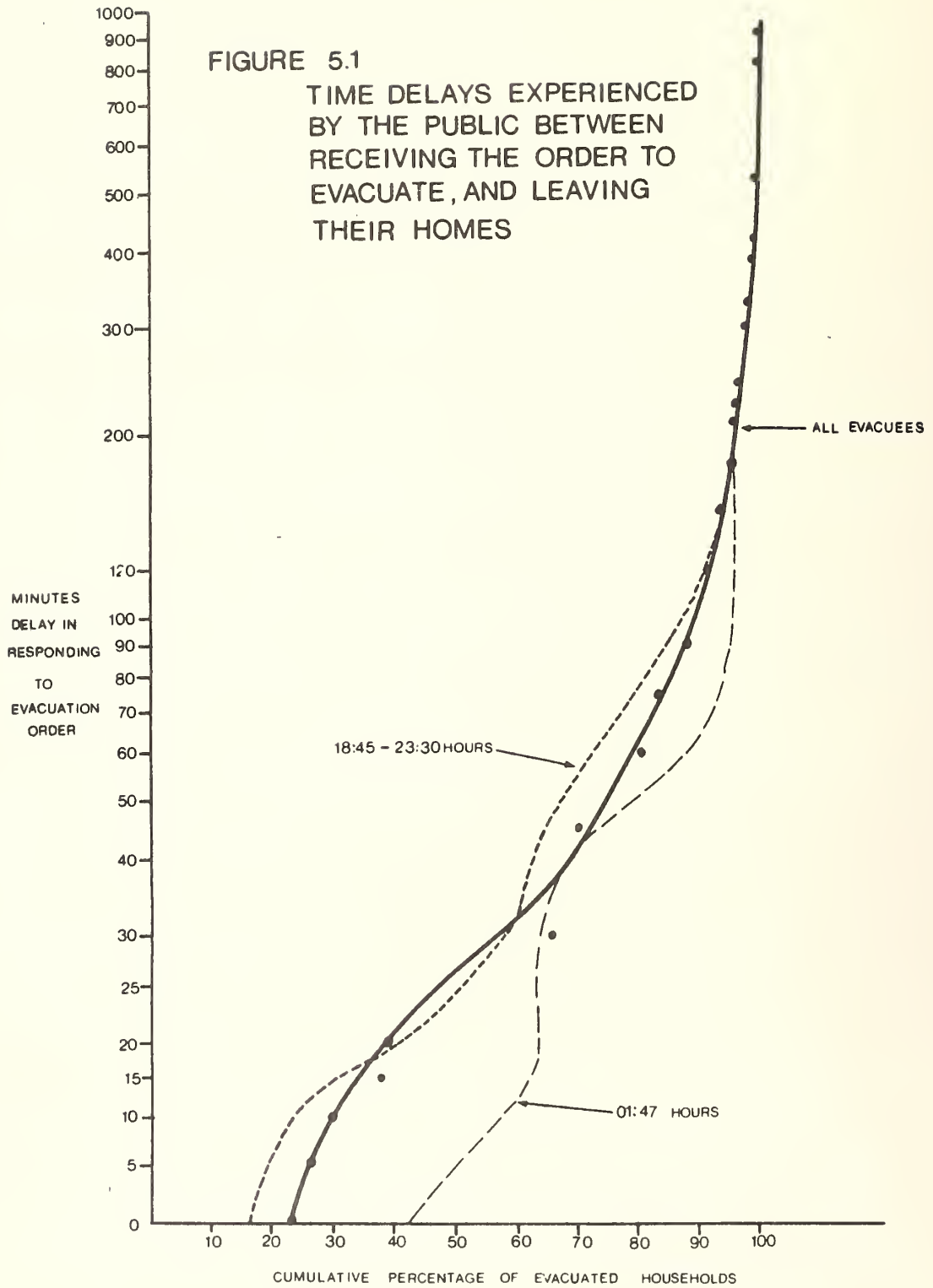
Table 5.4. Times at which zones were officially evacuated and populations involved

<u>Zone</u>	<u>Time ordered to evacuate Sunday, November 11</u>	<u>Population Estimates</u>
1	01:47	3,500
2	04:15	350
3	06:20	575
4	06:30	900
5	06:30	
6	06:30	4,400
7	07:29	6,200
8	08:30	19,315
9	09:40	7,618
10	11:10	28,672
11	13:10	
12	17:00	17,430
13	17:10	58,280
14	18:45	38,390
15	20:16	26,210
16	23:30	1,500
Total		213,000 <sup>1</sup>

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<sup>1</sup> These population estimates (from Peel Regional Police) add up to 213,000 whereas this report uses a figure of 226,000 for the population of the evacuated area, based on data from the Mississauga Municipal Planning Department. The exact population is difficult to determine because of the number of new housing developments and the length of time elapsed since the last Census in 1971.





first zone were evacuated; many people having left before they were asked to.

People in the last zones to be cleared, between 18:45 and 20:16 hours, also seemed to divide themselves into early leavers (15-30 minutes' delay) and late leavers (60-90 minutes' delay). Even here, 50% of the homes were empty within 30 minutes of the warning for their zones (Figure 5.1).

These time delays are highly relevant to evacuation planning. If the public perceives itself at risk and has almost universal access to mass media news reports and to a car, 90% of private homes can be evacuated within two hours. This also assumes that families are together and that traffic is kept flowing. Evidence from Mississauga and elsewhere shows that families will make individual searches for absent members, particularly if they are children, in spite of any orders to evacuate.

### 5.3. EVACUATION JOURNEY

#### 5.3.1. Transportation

Almost all households in Mississauga left their homes by car. About 85% of the households used their own cars and another 10% went in neighbours' or friends' cars. Less than 3% of the population used public transit or taxis. Most families (79%) left together in one car and at the same time. Thus on Sunday, November 11, some 95,000 private cars left Mississauga (Table 5.5).

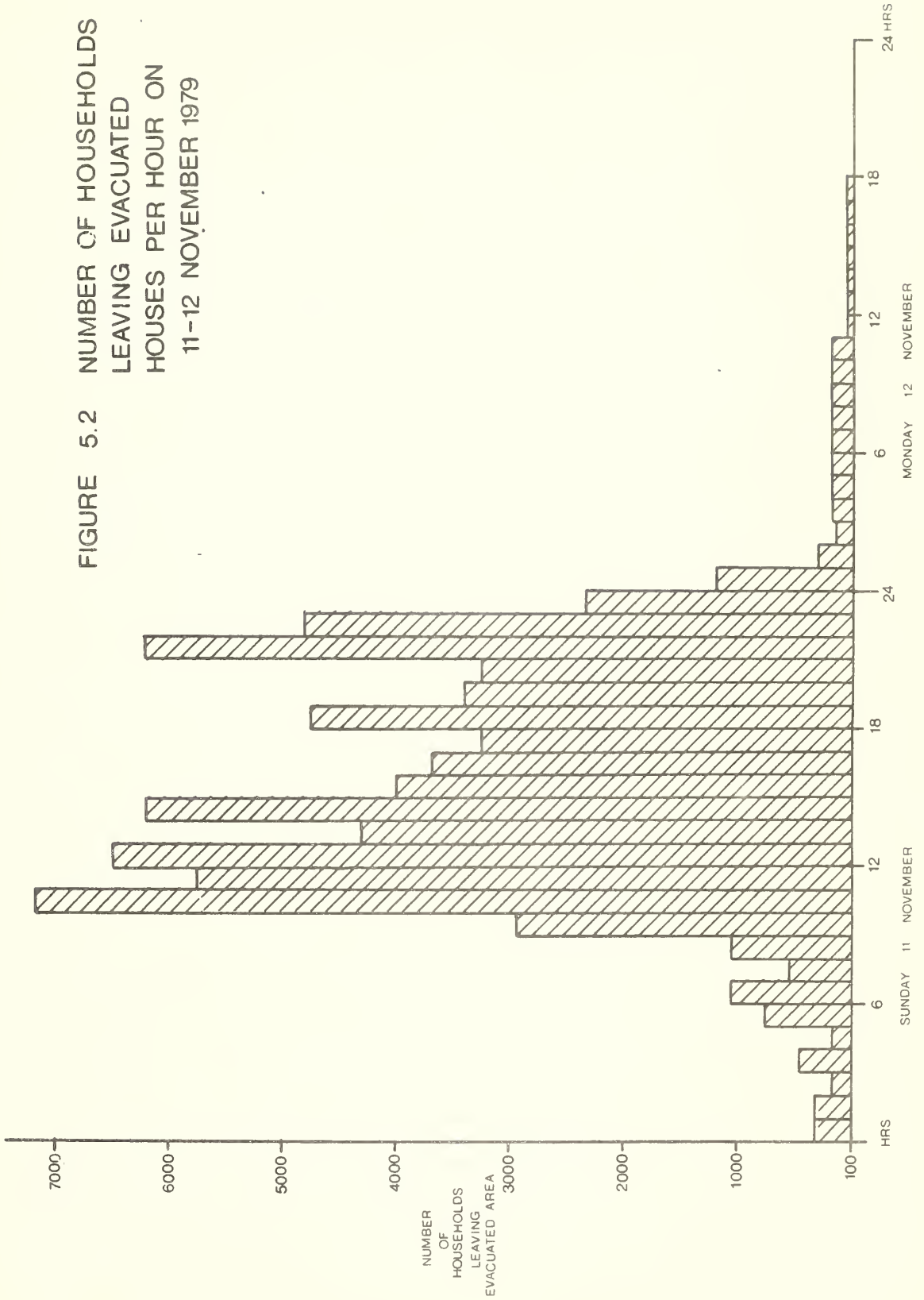
The time taken by evacuees to leave their homes after they had been asked to indicates that, had the whole evacuation zone been declared at once, some 76,000 vehicles would have been on the roads within the first hour. Instead, the

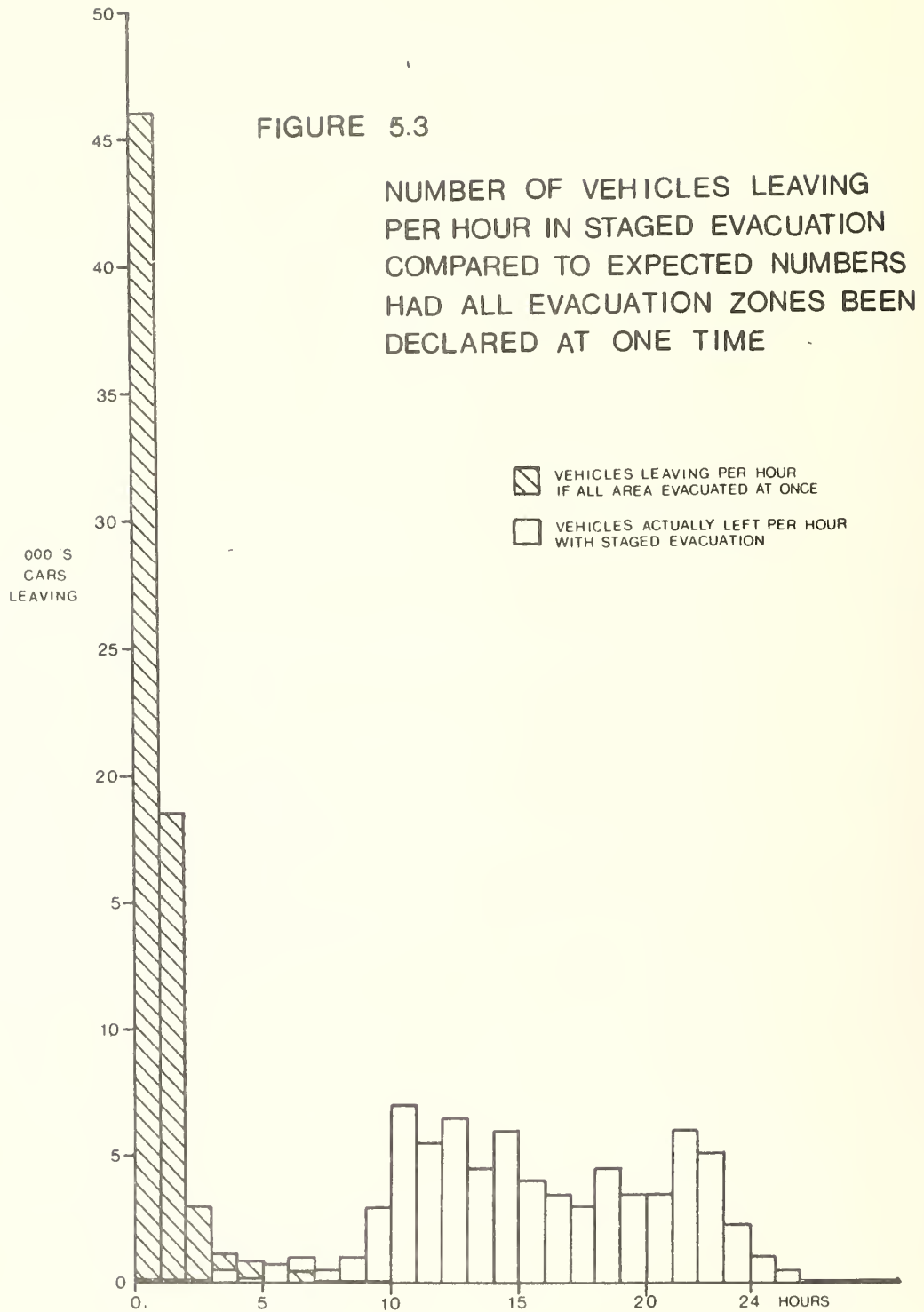
Table 5.5. Vehicles used to leave home

(a)	<u>type of vehicle</u>	<u>total number of households</u>	<u>percent</u>	
	Own car	66,400	88	
	Other car	6,600	9	
	Public transit	1,000	1	
	Taxi	1,000	1	
	On foot	<u>500</u>	<u>0.5</u>	
		75,500	99.5%	
(b)	<u>number of vehicles used</u>			<u>total number of vehicles</u>
	1	59,600	79	59,600
	2	13,600	18	27,200
	3	<u>2,300</u>	<u>3</u>	<u>6,900</u>
		75,500	100%	93,400

staged approach, involving evacuation of people by 16 smaller stages, produced a maximum flow of just over 7,000 households or 9,000 vehicles per hour. This peak flow leaving homes occurred between 10:00 and 11:00 on Sunday morning (Figure 5.2). Other peak hours for traffic flow were 12:00 - 13:00, 14:00 - 15:00, 18:00 - 19:00 and 21:00 - 22:00 on Sunday, November 11. By whatever judicious mixture of design and circumstance, the timing of the evacuation effectively spread the peak flows over most of the day instead of creating huge traffic jams in the first hour (Figure 5.3).

FIGURE 5.2 NUMBER OF HOUSEHOLDS  
LEAVING EVACUATED  
HOUSES PER HOUR ON  
11-12 NOVEMBER 1979





### 5.3.2. Directions and distances travelled to first destinations

The distances and directions travelled by evacuees were influenced by:

- (a) the evacuees' expectation that they would return within 12-24 hours;
- (b) the locations of major urban centres like Toronto and Hamilton;
- (c) the geographic pattern of the evacuees' social networks;
- (d) whether they decided to go to a private home, a hotel, or to an Evacuation Centre.

They do not appear to have been influenced by:

- (a) the times at which they were evacuated;
- (b) the phasing of the evacuation zones in relation to desired travel directions;
- (c) the socio-economic characteristics of the household;
- (d) the size of the evacuating household.

Most evacuees (84%) were heading for specific, pre-arranged destinations at the homes of friends or relatives. Among the choices open to them, they selected homes that were nearby. Twenty-five percent of evacuees stayed within 5 kilometers, and 60% within 10 kilometers of their homes. Almost all households (95%) remained within 100 kilometers of their homes (Figure 5.4).

The directions they travelled in were influenced by the locations of major reception areas such as Metro Toronto and Hamilton. Figure 5.5 shows the specific evacuation locations of evacuees who were questioned in the survey and Figure 5.6 illustrates the directions and distances they travelled. About half the evacuating families travelled in a north-east or easterly direction towards Toronto. Another 13% went south-west towards Oakville, Burlington and Hamilton.

FIGURE 5.4 KILOMETRES TRAVELLED BY EVACUEES  
TO FIRST DESTINATIONS

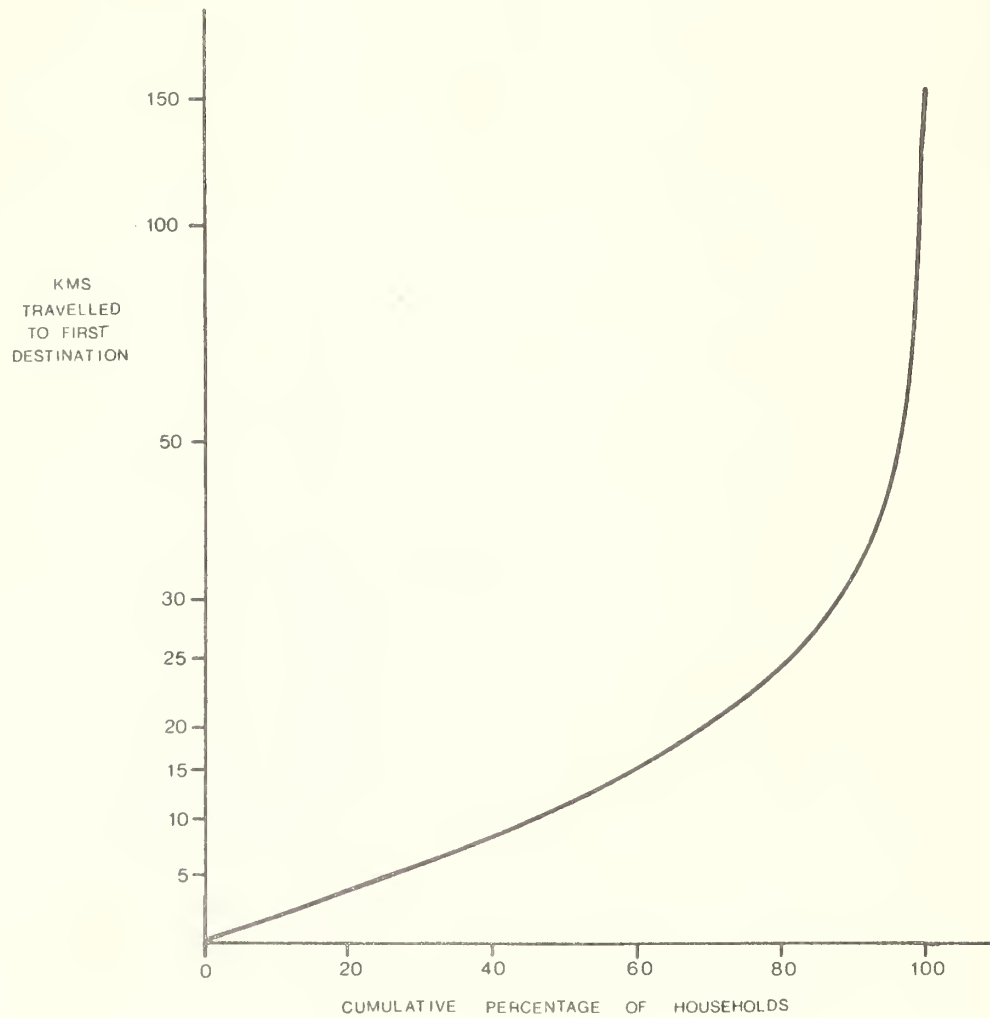




FIGURE 5.5

EVACUATION DESTINATIONS  
OF HOUSEHOLDS INTERVIEWED

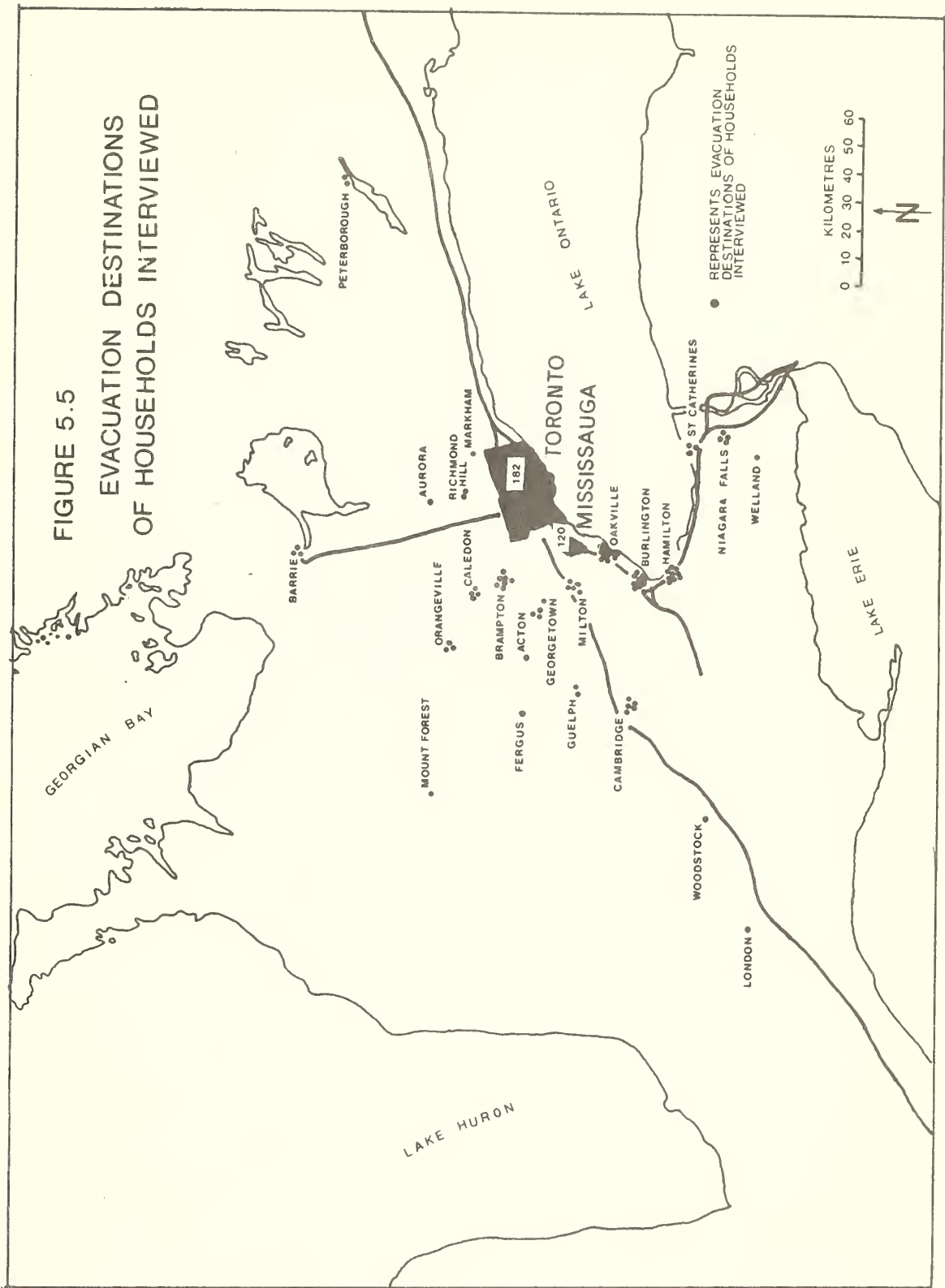
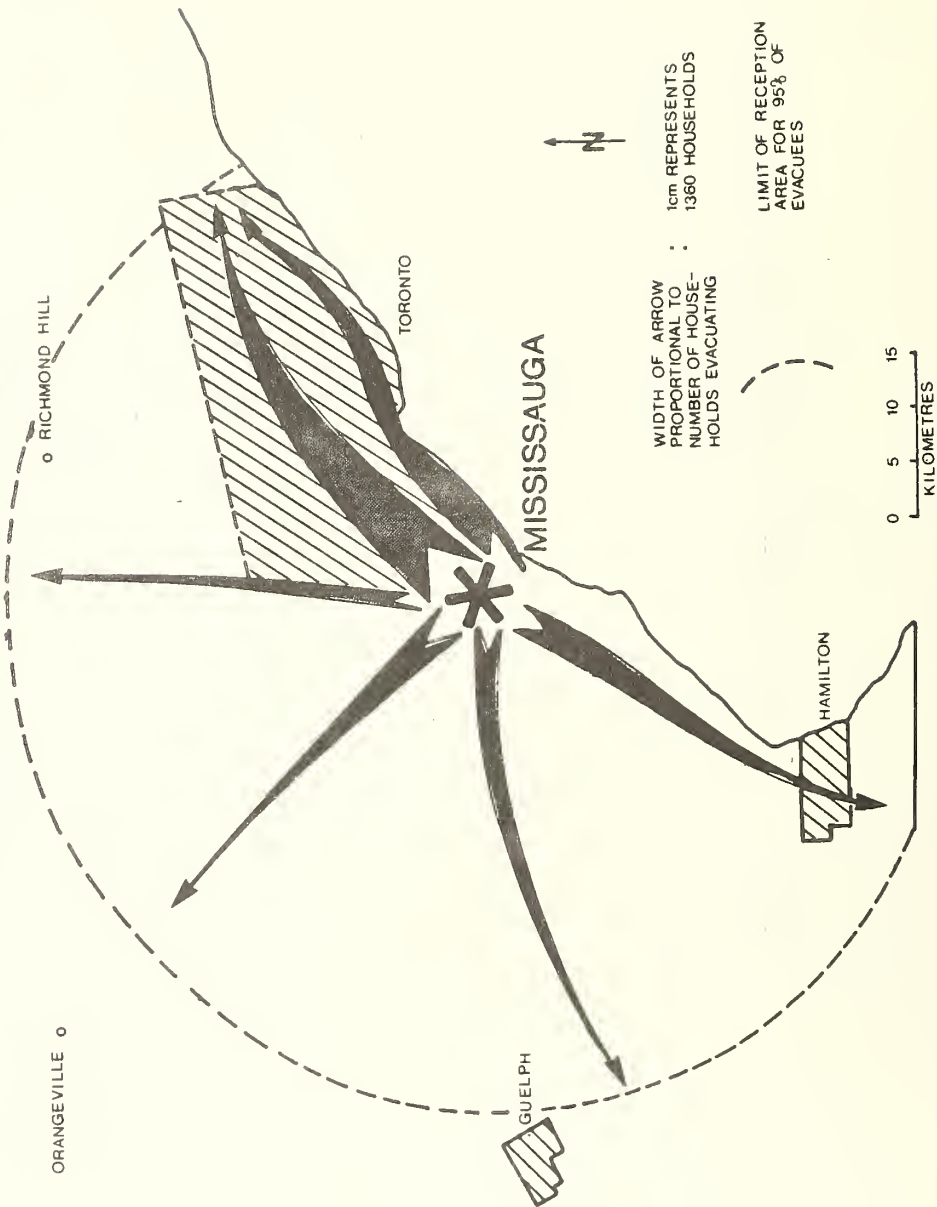


FIGURE 5.6 WHERE EVACUEES WENT:  
NUMBER OF HOUSEHOLDS BY DISTANCE AND DIRECTION  
OF FIRST DESTINATION POINT



People from any zone in the evacuated area were equally likely to go in any direction and to travel any distance. Families with children, and people with lower incomes did not tend to go farther, or to stay closer, than others. The most influential factor in whether people stayed within 10 kilometers of the accident site was the type of accommodation they selected - private home or hotel versus Evacuation Centre.

For their first destinations, 28% of evacuating households chose to stay within Mississauga, so that approximately 20,800 households had to evacuate themselves again as the boundaries were moved out (Table 5.6).

Table 5.6. First destinations of evacuees

	<u>Percent of</u> <u>sample (N=504)</u>	<u>Total number of</u> <u>households involved</u>
Within Mississauga	28	20,800
Elsewhere in Peel Region	17	12,700
Etobicoke	9	7,200
City of Toronto	13	10,000
Elsewhere in Metro Toronto	19	14,500
Elsewhere in Ontario	13	10,000
Outside Ontario	0.2	150
Outside Canada	<u>0.2</u>	<u>150</u>
Total	99.4%	75,500

The need to evacuate twice was most common among households who went initially to an Evacuation Centre; 80% of these families had to move again compared to 27% for evacuees going to private homes and hotels.

The evacuees' choice of an evacuation base inside Mississauga was influenced by two expectations: that they would only be away for a few hours (Table 5.3); and they did not know that the entire city would eventually be evacuated. Figure 5.7 shows the relationship between the type of accommodation and the reception areas chosen by evacuees.

The most significant differences are between Evacuation Centre users and the rest.<sup>1</sup> Some of the Evacuation Centres were set up within the final boundaries of the evacuated area and others were located just beyond its boundaries. People who used the Centres were therefore obliged to remain fairly close to their homes.

Only 1.5% of evacuees (1130 families) went to second homes. This is related to their expectation that they would be away for only a few hours and to the fact that cottages in Ontario are usually several hours' journey away and are closed up for the winter by November.

### 5.3.3. Subsequent destinations

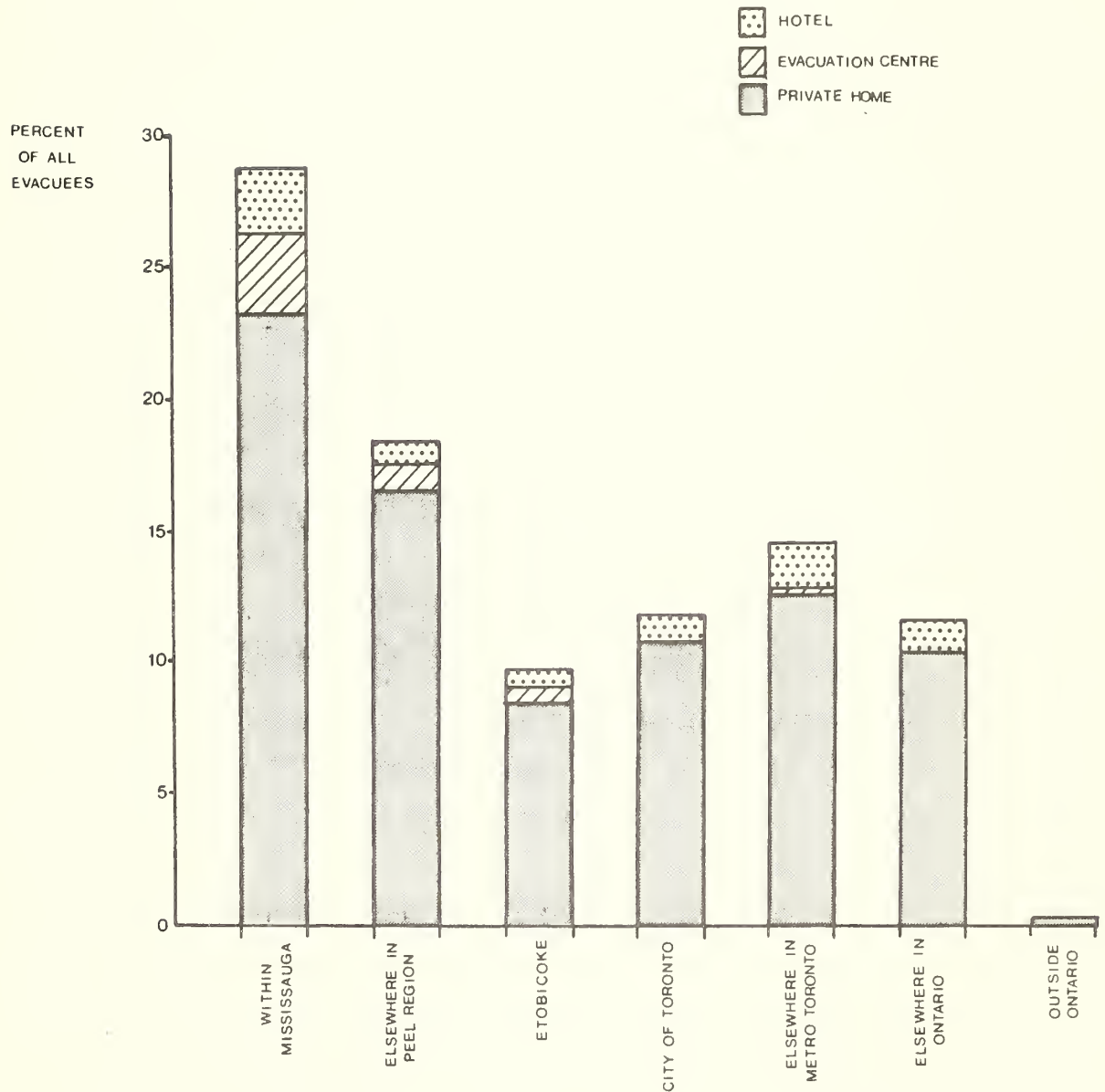
Thirty percent of the evacuating households (22,650 families) did not remain at their first destinations throughout the emergency, but moved on to second destinations. Eight percent went to a third, and a few people went to four destinations.

In all evacuation moves, private homes were the most frequent choice of accommodation. However, in second and

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<sup>1</sup> See Appendix 1 regarding the sample limitations of households who went to Evacuation Centres.

FIGURE 5.7 RECEPTION AREAS FOR EVACUEES  
STAYING IN PRIVATE HOMES,  
HOTELS AND OFFICIAL SHELTERS  
(first destinations)



third moves, there was a tendency for people to move out of private homes and Evacuation Centres and into hotels (Table 5.7).

Table 5.7.      Types of accommodation used in first, second and third destinations

	<u>First move</u>	<u>Second move</u>	<u>Third move</u>
	%	%	%
Private home	87	20	4
Hotel	6	3	2
Evacuation Centre	4	2	0.5
Second home	<u>3</u>	<u>3</u>	<u>0.5</u>
	100%	29%	7%

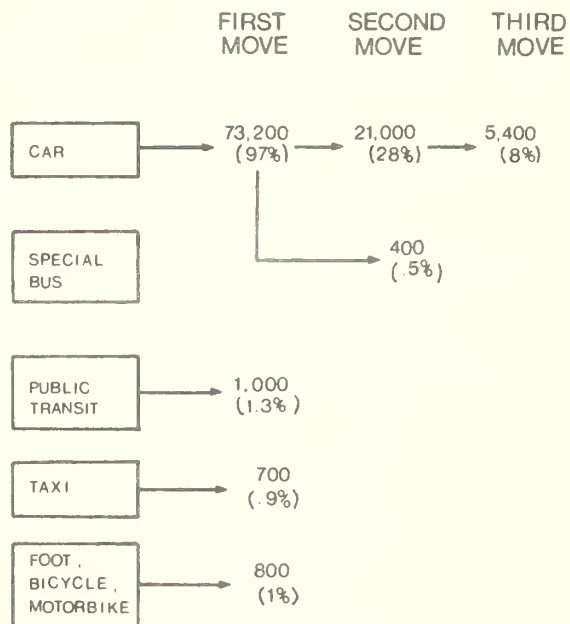
Percentages are of total number of evacuees; thus, 29% of all evacuees moved to at least two destinations, and 7% to three or more.

The vehicles used in subsequent moves also predominantly private cars. About 2,500 households went to their first destinations by public transit, taxi or on foot, bicycle or motorbike, and in subsequent journeys, an estimated 400 households (1500 people) were bussed from Evacuation Centres (Figure 5.8).

Of the people who initially went to an Evacuation Centre, 32% moved again, as against 29% for all evacuees. Some of these people chose to find their own accommodation elsewhere and stayed only a few hours in a Centre. Other people were moved to Centres farther away when the early Centres were themselves evacuated. About 1,600 evacuees in the Centres were also transferred to private homes or

FIGURE 5.8

# NUMBER OF HOUSEHOLDS TRAVELLING FIRST, SECOND AND THIRD DESTINATIONS



PERCENTAGES ARE OF TOTAL NUMBER OF HOUSEHOLDS TRAVELLING TO FIRST DESTINATION 25% OF ALL EVACUATED HOUSEHOLDS MOVED TO A SECOND DESTINATION

PERCENTAGES MAY NOT AGREE WITH TABLE 5.7 DUE TO ROUNDING



hotels. Fourteen percent moved a third time and nearly 6% moved again to a fourth temporary accommodation.

Table 5.8 shows the type of vehicles used in these subsequent journeys.

Table 5.8. Vehicles used to travel to and from evacuation destinations by people who went first to an evacuation centre.

	First Destination		Second Destination		Third Destination		Fourth Destination	
	Arrive/Depart		Arrive/Depart		Arrive/Depart		Arrive/Depart	
	%	%	%	%	%	%	%	%
Car	84	77	20	24	9	9	3	4
Truck	3	2	-	-	1	1	1	-
Bus	8	15	11	6	4	3	2	1
Public Transit	2	4	-	1	-	1	-	-
Taxi	1	-	-	-	-	-	-	-
Other	3	3	1	1	-	-	-	1

Percentages are of number of evacuees travelling to a first destination.

Again, the most important means of transportation for all journeys was the private car. Families had to leave their cars at the first Evacuation Centre and move on to other Centres or hotels in special buses. They report regret and frustration when this happened because they were no longer mobile during the day. They suffered an increased sense of isolation from their normal activities and imprisonment in the Centres. They could no longer easily visit shops and

cinemas or go to work. Some evacuees objected strongly to being obliged to go to hotels in the special buses provided on Wednesday and, after checking in, they went back on the buses to retrieve their cars at the Centres.

When people no longer have access to their homes, it would seem to be desirable to allow them to keep their cars with them whenever possible. This reduces the amount of inconvenience and frustration they experience during an evacuation.

#### 5.4. THE RETURN HOME

The evacuees were away from home for periods of 1-9 days. Most were away for at least 3 days and 90% had returned within 6 days (Figure 5.9). Evacuees going first to a Centre had, on average, a longer period away from their homes and returned later in the week (Table 5.9). Fifty percent of users were away for 5 days or more, compared to only 3 days or more for all evacuees (Figure 5.9). Those evacuees who moved again spent only one or two days at their first destination.

The main groups of returning evacuees arrived home on Tuesday, 13 November (51%) and Friday, 16 November (33%). Of the Evacuation Centre people, 27% went home on Tuesday, and 47% went home on Friday (Table 5.9).

On Tuesday, 13 November, about 144,500 people were allowed back into the outer zones (Figure 2.6). The re-entry announcements were made between 15:10 and 16:50 on Tuesday afternoon so that some families did not go home until Wednesday. Confusion about which zones were re-opened and a belief among evacuees that their family could return, led

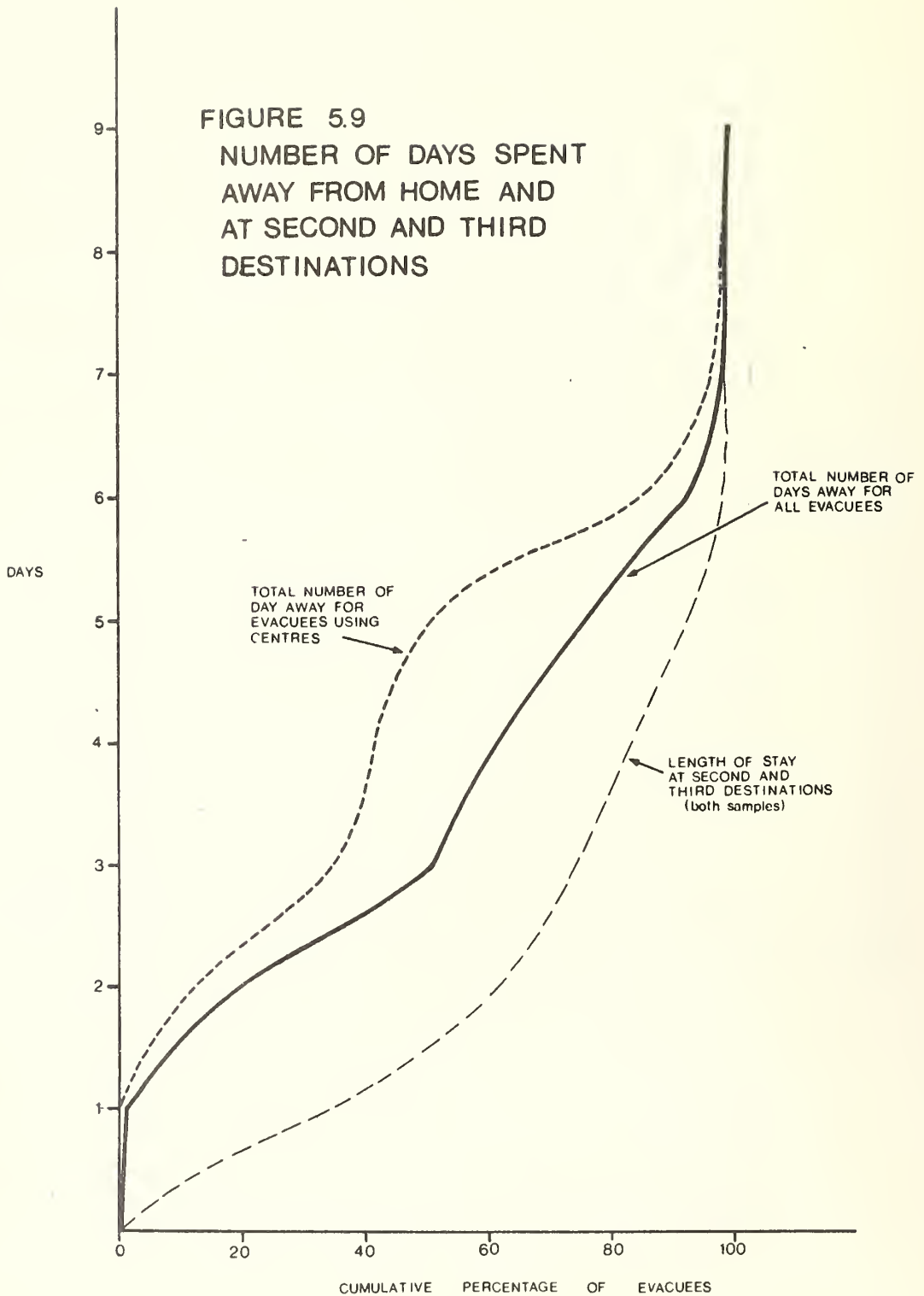


Table 5.9. Days on which people returned to their homes

Returned on:	All evacuees (N=545)	Those using evacuation centres (N=175)
	%	%
Monday November 12	0.4	1.6
Tuesday November 13	37	27
Wednesday November 14	13	5
Thursday November 15	3	3
Friday November 16	33	47
Saturday November 17	11	13
Later than November 17	<u>2</u>	<u>3</u>
Total	99.4%	99.6%

to major traffic congestion at the Trafalgar Road exit from the Queen Elizabeth Way and elsewhere.

From Tuesday on, many evacuees tried to return to zones which were still closed and the smooth return of the evacuees was seriously disrupted by an estimated 18,000 additional vehicles that tried to return before they were allowed back. At road blocks still sealing off some areas, frustrated evacuees argued with police about whether they could go home and caused additional traffic problems. Part of the problem was that the public sometimes heard about boundary changes from radio or television before the police on the perimeter did from their commanders.

The re-entry on Friday, 16 November took place in 2 stages: 37,000 people were allowed in from 14:55 hours and the last 35,000 residents, who lived close to the accident site and south of the Queensway, at 19:40 hours, after the rush hour. Many of these people were so anxious to get home that they travelled on Friday evening. Only 13% of all evacuees waited until Saturday, 17 November, to return home.

The major problems returning evacuees reported were the traffic congestion, and frustration among those who were turned back. When they arrived home, most of them (73%) ventilated their houses to make sure that there was no chlorine gas. A few families whose members had specific health problems, such as asthma, had one member go back to do this. They checked on the security of their property and on the welfare of their pets and houseplants. Despite widespread concern while they were away about looting (reported as a concern by 62%), there were 38.5% more break and enters reported during the week prior to the evacuation. For the first few hours in their home, people rested, bathed and changed clothes and set their houses in order.

#### 5.5. PEOPLE USING EVACUATION CENTRES

##### 5.5.1. Who were they?

According to our surveys, 5% of the evacuees, or 3775 families, used the Evacuation Centres. Their average family size was 3.7 people. This gives a figure of nearly 14,000 for the numbers of people cared for in official shelters. Many of these evacuees (38%) stayed only for a few hours and did not sleep overnight in the Centre. They moved on to hotels or to private homes. Therefore, only about 8,700

people spent one or more nights in a centre (Table 5.10).

Table 5.10. Numbers of days stayed by people in Evacuation Centres

<u>Time</u>	<u>% of sample</u>	<u>Approximate number of people</u>
< 24 hours	38	5,320
1 day	17	2,380
2 days	14	1,960
3 days	21	2,940
4 days	3	420
5 days	1	140
6 days	4	560
7 days	<u>2</u>	<u>280</u>
Total	100%	14,000

The people who used the Evacuation Centres were not a random cross section of Mississauga, although they came from all zones within the evacuated area. Significantly more of them were in the lower income categories (28% had annual family incomes of less than \$15,000 compared to only 12% for all evacuees). They also tended to come from the blue collar worker group (Table 5.11). Their mean family size was larger (3.7 compared to 3.2 for all evacuees) and more of them lived in rented accommodation (32% compared to 23% for all evacuees).

There were also significant socio-economic differences within the group using Evacuation Centres. Those families who left after less than 24 hours were most likely to be people in professional and managerial occupations, to own their own houses, and to earn higher incomes. Thus, as the evacuation

Table 5.11. Occupations of heads of evacuated households, comparing all evacuees with those using official shelters

Occupation Group:	<u>All evacuees</u>		<u>Evacuees in Centres</u>	
	(N=504)		(N=175)	
			All	Those staying 3 or more days
		%	%	%
Professional/ managerial	48		31	23
Clerical/ sales	16		16	23
Industry/ construction	15		27	32
Transport worker	3		5	3
Homemaker	2		2	3
Retired	9		11	12
Self employed	8		8	6

continued, the people staying on in the Evacuation Centres were more and more likely to be from blue collar worker families with lower incomes. After 3 days, some 15% of all the industrial and construction worker families in Mississauga were in Evacuation Centres compared to only 2% of the families of managerial and professional groups.

The socio-economic composition of people in the different Centres also varied. A greater proportion of evacuees in the International Centre and in Streetsville Secondary School had family incomes below \$15,000 and did not own their own homes. Erindale Secondary School received more evacuees over 70 years old (11% compared to 3% for all



A night in the car.....

Mrs. C. was 8-1/2 months pregnant when the derailment happened. She comes from Holland and her husband from England. They met in Holland while her husband was serving with the Armed Forces. Mrs. C.'s uncle phoned from Holland on Sunday morning to ask if they were alright after the accident. That was the first thing they heard about it.

Later on Sunday, they saw neighbours packing and were warned by them to leave soon if they wanted to get a hotel room. They asked some other neighbours where they were going. They said, to the International Centre. So Mr. and Mrs. C. decided to follow them. This was about 7 o'clock on Sunday evening. They thought that they would be away for a few hours and only brought along blankets and pillows for themselves and cat food and water for their cats.

When they arrived at the International Centre, it was being set up. A bingo game had just been cancelled and the cards were still on the tables. The Red Cross were already there and showed some concern about Mrs. C.'s advanced stage of pregnancy.

At first, everything was disorganised but later it got better. Food and hot drinks came in. But when everyone tried to go to sleep, they found that the floor was cold, there was no bedding, and many old people were lying on tables to get off the floor. Mr. and Mrs. C. decided to sleep in their car that night. They got up at 5:00 A.M. and went back into the Centre but returned to the car again to listen to the car radio.

Later on Monday, they went out to buy toothbrushes, and socks and tried to find a hotel, but they could find nothing closer than Niagara Falls. Each hour they thought it would all be over and that they could return home. Everyone at the Centre was like that - just waiting and waiting.

By 6 o'clock on Monday evening, they realised that they were going to be there for another night. Mr. C. got hold of a table for his wife to lie on and arranged their blankets on it. Just then, a

Continued. . .

Red Cross volunteer came over and said that a man from Pickering had come to offer his home as a temporary shelter for someone, but that no one would take him up on it. Would they like to?

Mr. and Mrs. C. went home with their new found friend, ate and went straight to bed. The next day, he went to work and left them with the run of the house. When they heard on Tuesday evening that they could go home, he drove them back to the Centre. Since the evacuation, they have become very good friends.

They often compare what happened in Mississauga with their experiences in Europe. They felt the evacuation was not well organised and that the army should have been asked to run things and to provide cots. They also felt that everyone was greedy about compensation, but they also made claims, because, after all, this is North America.

Mrs. C. never had any concern about her pregnancy (you, you don't know Dutch women!), although her husband was nervous during the evacuation. She gave birth to a boy two weeks later.

Centres). Otherwise, the proportions of age groups in the Centres were similar to that in the general population.

#### 5.5.2. Behaviour in the Centres

Most evacuees behaved quietly and cooperatively in the Centres. Members of the voluntary organisations such as the Red Cross, Salvation Army and St. John Ambulance all report that morale was highest to begin with, and fell rapidly after 3 days. People became bored; children and pets became restless; and the number of volunteer helpers declined as they went back to their normal jobs. The evacuees became mentally and physically tired, and a few showed signs of increasing dependency. Some evacuees helped the volunteers but many remained fairly passive, accepting whatever food or entertainment they were offered. This was especially so in the International Centre and in Streetsville Secondary School.

Older people and those who could not speak English were the most confused and anxious. Young people (some of whom were not evacuees but "free-loaders") tended to make the most noise and to cause difficulties for those in charge. Many people could not sleep at night in the International Centre and Streetsville Secondary School. The greatest number of complaints about the former were about the nuisance from pets.

In retrospect, the majority of evacuees had nothing but praise for the excellent and untiring work put in to the Centres by volunteer workers. At the time of the emergency, these same workers met with some anger and resentment on the part of evacuees who wanted to know when they could go home. It was this uncertainty, rather than the fear of the accident itself, that seemed to make people most unhappy. Lack of information was also a problem for evacuees during their

first 24 hours in the Centres before communication channels and clear lines of authority were properly established.

In two Centres there were reports of problems in keeping order. People tried to enter classrooms and some vandalism was encountered at Streetsville Secondary School. Fighting broke out between youths. Generally, however, people mixed well and made friends, although at the International Centre, it was reported that black families kept mainly separate from the white majority.

About a third of the evacuees who stayed overnight at the Centres spent all the time there. Others made a number of trips outside, mainly to shop or for recreation (such as cinema shows). Only 10% report leaving during the day to go to work and only 5% went to find their friends or other family members (Table 5.12). Although many had access to their cars, they generally remained within walking distance of the Centres.

Thus the pattern of behaviour for the evacuees in the Centres was more dependent and more confined than for other people in private homes and hotels. The evacuation experience was farther removed from their everyday lives than for others and led to some different social impacts (Chapter 6).

## 5.6. THE PEOPLE WHO STAYED BEHIND

### 5.6.1. Characteristics of the households

Out of the 1089 households questioned in the first and second main surveys, 19 families or 1.7% said that they did not evacuate. Fourteen families were subsequently interviewed to find out why they remained inside the evacuation

Table 5.12. Number and purpose of trips made by evacuees out of the Centres

(a) <u>Number of trips</u> (N=175)	<u>Percentage of evacuees</u>
Left after 0-12 hours: no trips	38
Stayed one or more nights: no trips	31
1 trip	12
2 trips	9
3 trips	3
4 trips	1
5 trips	1
6 trips	2
7 trips	1
8 trips	0
9 trips	2
	<u>100%</u>
(b) <u>Purpose of trip</u>	
To get food	8
To shop	25
To seek other accommodation	15
For recreation	18
To go to work	10
To help in emergency	7
To seek information	2
To find friends, family	5
Other	<u>10</u>
	<u>100%</u>



zone. The small numbers involved do not allow statistical comparisons to be made between those who stayed and those who left, but some inferences can be drawn about their reasons for remaining and their socio-economic characteristics.

They are discussed in some detail because it is important to evacuation planning to be able to predict the numbers and characteristics of those who are likely to refuse to leave. An understanding of their reasons for staying can also better enable authorities to persuade them to leave. In the case of the Mississauga emergency, the knowledge that at least 1200 families had not evacuated could have influenced decisions about how to handle the emptying of the chlorine gas tanker. In any emergency, the response of authorities may be unduly influenced by the few people who refuse to leave; and in turn, influence decisions affecting the 98% who do evacuate.

The heads of households who decided to remain behind were mostly in their fifties and sixties (Table 5.13). They were highly educated people in professional, managerial and sales occupations. Only 3 earned less than \$15,000 per annum and most earned nearer to \$30,000. They were generally families rather than single people and half of them had children, mostly older ones. No one had very young children under 3 years old.

They mostly lived very close to the evacuation zone boundaries, or on the opposite side of the Credit River Valley to the accident. Two families interviewed lived relatively close to the accident site; one lived 3 kilometers to the east and the other household was located 2 kilometers to the west (not across the Credit Valley).

The decision to stay was always made after a family discussion of the pros and cons. Often the discussion was

Table 5.13. Socio-economic characteristics of households  
who did not evacuate

(a) <u>Age of head of household</u>	
	<u>Number in sample</u>
20's	4
30's	1
40's	2
50's	7
Over 60	<u>5</u>
TOTAL	19
(b) <u>Occupation of head of household</u>	
Professional/managerial	6
Clerical/sales	5
Industrial worker	2
Transport worker	1
Self-employed	2
Retired	<u>3</u>
TOTAL	19
(c) <u>Household income per annum</u>	
Less than \$15,000	3
\$15,000 - \$30,000	11
More than \$30,000	4
No answer	<u>1</u>
TOTAL	19
(d) <u>Number in household</u>	
1 person	3
2	6
3	5
4	1
5	<u>4</u>
TOTAL	19



led by one family member who wanted to stay, and this person convinced the others. In 3 of the families, not all family members agreed, and the family split up, with some leaving and others staying.

#### 5.6.2. Reasons for not evacuating

The commonest reason for staying was that people did not consider the risk was sufficient justification to leave. They generally were located on the outer edge of the evacuated area and felt far enough away:

*The reason we didn't leave our house was the fact that the community of Etobicoke - just on the other side of Etobicoke Creek from us - was not evacuated, and if they were considered safe, then for all practical purposes, so were we.*

Those people who stayed who lived on the other side of the Credit Valley reasoned that since chlorine is heavier than air, it would not cross the valley and reach them, but would roll downstream. They also believed that the wind from the direction of the accident did not blow towards them. They included people who had occupational experience of handling chlorine.

One household consisted of an elderly couple in which the wife was confined to a wheelchair. They made the decision to stay explicitly on account of her health; they decided it was safer not to move her.

The factors that contributed to these families' decision not to evacuate included:

- (a) their belief that there was no real danger to them based on:
  - (i) their location or
  - (ii) their knowledge of chlorine;

Staying behind.....

Mr. P. had spent 30 years out west as a farmer and cowboy. He had learnt to become self-sufficient and not to scare easily. Now he is an industrial relations consultant in his sixties, living with his wife in a comfortable home, less than a mile from the accident site.

He was woken up by his wife who heard the blast. Then their neighbours called them and said to come over to see the fire from their upper storey window. Later he returned to bed and slept until 7:30 A.M. on Sunday.

At 4 P.M. on Sunday afternoon, a very young policeman came to the door and said that they had to leave. Mr. P's wife wanted to go, although he was reluctant. They made a reservation at a hotel and began to pack the car with valuables that he didn't want to leave behind.

Travelling east along Dundas, they were stopped by the O.P.P. An officer told them that they could not go any farther. Mr. P. protested and pointed out that he was evacuating as requested, and heading for Toronto. The officer told him to go around by the 401. With that, Mr. P. said "I have a good mind to go home". The policeman laughed and said "That's a good idea". It was all Mr. P. needed. He wheeled the car right around and turned back.

For the next week, Mr. P. and his wife remained in their home. He patrolled the area with a high-powered flashlight each night. Several times during the week he met police officers who asked him questions and checked his identification. Some thanked him for doing his rounds; others told him that he was a prime suspect for looting. A helicopter overhead would also shine its searchlight on them and Mrs. P. was scared it would "pluck them up".

Mrs. P. was more nervous. She often thought that she could smell chlorine gas and she had a few things packed in the car for overnight. She became less worried as the week went on. Their son kept phoning from Guelph asking them to come to his place. Mrs. P. managed to do all her Christmas baking uninterrupted. They had plenty of supplies.

On Thursday, a neighbour who was going on a holiday to the Caribbean, called Mrs. P. and asked her to start packing her suitcases for her. They already had the house key. Later that day, the neighbour came back under escort, and picked up the suitcases. Another neighbour

Continued. . .

stopped by on Friday and had a drink with them. He had had to leave his driving licence with the police officer at the roadblock.

Also on Friday, another neighbour's son and a friend had come across the Credit River and were in their house next door. They told Mr. P. about another neighbour, across the street, who had not left either. Mr. P. hadn't even noticed them.

Mr. P. enjoyed the solitude of the evacuation. It reminded him of his days on the farm with miles and miles between him and the next person; "nothing but myself, my dog, my horses and the coyotes".

- (b) their belief that if the situation changed, they were prepared because:
  - (i) they would be warned because they were constantly monitoring the radio,
  - (ii) (for some) the police knew where they were and would tell them,
  - (iii) they could leave quickly because they had a car ready and suitcases packed; and no traffic would impede them;
- (c) their need to stay to look after a large number of plants or animals (2 households);
- (d) their attitudes about the rights of individuals versus those of authorities;
- (e) they had not been asked to individually by the police although they heard the loud hailers in the street;
- (f) they could not think of any friends or relatives to stay with;
- (g) their previous experience with emergencies which made them downplay the danger in Mississauga and resist evacuation. These experiences included:
  - (i) London blitz during World War II,
  - (ii) living in Germany, Poland, Russia, England or Ireland during World War II,
  - (iii) London smog emergency of 1952.

The people who cited their previous experience with emergencies were all immigrants to Canada from Europe. They tended to feel that Canadians defer too easily to authority and overreact to emergencies. Those who had been evacuated during wartime had unpleasant memories of the experience. It is interesting, if not significant, that in 10 of the 14 families interviewed, at least one adult had been in Europe during the Second World War, although not all of them thought that this had necessarily influenced their decision to stay behind in Mississauga.

### 5.6.3. Behaviour during the evacuation

The people who stayed behind fell into two groups; those who were known to the police and those who were not. Their behaviour patterns were very different.

Those who had contact with authorities felt free to walk or drive around the evacuated area. Some spent the time fixing things in the house during the enforced holiday from work. They were very aware of the quietness of the deserted streets and enjoyed the sensation of being alone in a deserted city. They did not have contact with other families and believed that there was no one else left in their area. Two men reported that they patrolled their neighbourhoods at night for prowlers and reported suspicious people to the police.

Some of these people also continued to go to work each day. They had to return through the police road block by stealth or by argument. One man drove each of his two cars as far as a road block on two successive nights and walked through the checkpoint each time. Others knew routes by foot and by car that avoided the road blocks. However, one father deliberately chose not to go to work so that at no time would the family be split up.

The other group of people remained in their homes to avoid detection. They believed that they would be asked to leave if the police knew that they were there. Some said that they had not been specifically asked to leave by police at the door. It is possible that this group includes an unknown number of older people living alone (shut-ins) who do not listen to radio or television nor have much contact with other people. Some of these people may not have understood what was happening. Others certainly did know and



deliberately concealed themselves in their basements and by turning off lights when they thought the police might see them.

It is likely therefore that the number of 1200 families from the surveys is an underestimate of the people who remained inside the cordoned area throughout the entire emergency.

#### 5.7. ATTEMPTS TO RE-ENTER

About 14,500 people (19% of the main survey sample) tried to enter the restricted zone. Police transcripts indicate that later in the week of the evacuation, much of their time was spent escorting people to their homes and in dealing with requests from other, often angry, householders. The police perceived the many attempts to re-enter as a major problem for them.

The people who tried to re-enter came from a fair cross-section of Mississaugans and lived all over the city (there are no significant relationships between them and the rest of the sample in any socio-economic or locational variables). They were not people who were significantly more, or less, worried about the danger, although they were more critical about how the evacuation was handled. More of those who tried to return criticised the scale of the evacuation and the lack of information (Chi-square significant at .008 level).

The survey also shows that most people tried to return after they had been away for two days or more. The distribution indicates 2 peaks of re-entry activity (when

there were probably more than 3,000 attempts); on the third and sixth days that people were away from their homes (Figure 5.10).

Follow-up interviews with 32 householders who tried to return, shows that the 2 commonest reasons for the attempts were to look after pets and to fetch clothes (Table 5.14). Relatively few people went to find missing family members or to fetch vital medication. Some reasons were fairly trivial, such as to retrieve theatre tickets or tickets for the long-awaited Tutankhamen exhibition (in the event, people who said they were "Mississauga refugees" were let in without their tickets).

Table 5.14. Reasons why people tried to re-enter the evacuated area

	<u>Number</u>	<u>Percent</u>
To look after pets	16	28
To get clothes	16	28
To get medication	4	7
To find missing persons	3	5
To get travel documents, etc.	4	7
To get money, theatre tickets	4	7
To check house	3	5
To go home to stay	4	7
To get/return car	<u>3</u>	<u>5</u>
Total	57	99%

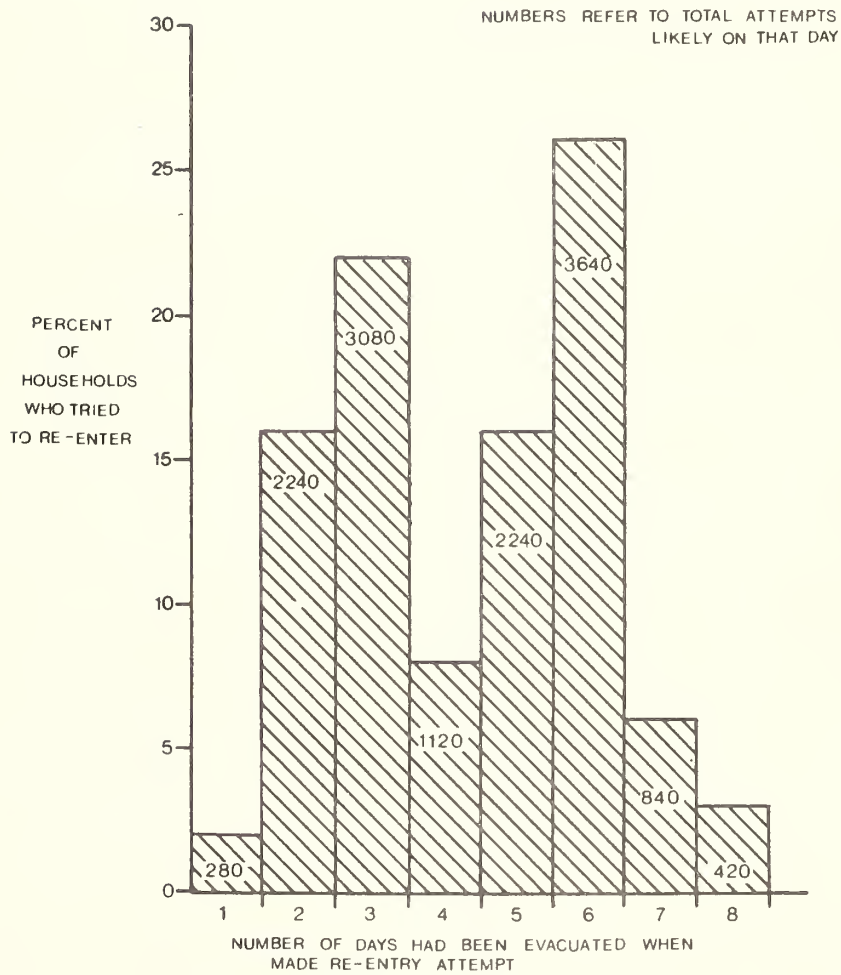
Number of people interviewed = 32; some had more than one reason.

Most people, if they succeeded in getting in, were at their homes a relatively short time. Police escorts would



FIGURE 5.10

WHEN PEOPLE TRIED TO RE-ENTER  
THE EVACUATION ZONE



wait outside the house for 10 minutes or more (involving a large amount of police time) and unescorted people also report being inside the area for only a short time. However, a few people just wanted to go home, sometimes because they said they had no friends to stay with. Some of these people succeeded in entering the area and staying at home for the rest of the evacuation.

People who attempted to re-enter to collect possessions were mainly men. They tried a range of methods and some made several attempts. The methods included:

(a) requests to police:

- (i) phone requests;
- (ii) go to police station and receive police escorts;
- (iii) go to roadblock and either;
  - get pass and return it on departure,
  - leave driving licence and collect it on departure,
  - get police escort.

(b) avoidance of police:

- (i) go around roadblock, usually on foot by back routes.

The commonest method reported was to go to the roadblock and persuade, or argue with, the police officers on duty. It seems that the greatest chances of success were when the roadblocks were quiet. People would wait around until other would-be entrants had left the barricade again and would then persuade the police "just to let them go in". The police were also more likely to let people in later in the week and farther away from the accident site. Only one man contacted in the study reported that he was allowed in to Zone 1 (nearest the accident) before Wednesday, 14 November, and this was to search for a missing teenage daughter. Other people in the same zone who needed medication were refused.

Attempts to get inside the perimeter.....

Mrs. Q. went to stay with friends in Burlington but her daughter is asthmatic, and their dog made her ill. Mrs. Q. could not find a hotel room so she came home. She entered the evacuation zone by the back roads on Monday night and met no one.

The next day, she took her daughter to school and was stopped by the police as she drove home. They took her name and told her that she would be charged, but she has heard nothing from them. A detective finally told her to go back in.

Her next door neighbour also stayed behind because her husband was away and she had nowhere to go. They both felt fairly safe because the police patrolled the area every hour and her neighbour or herself took turns to listen to the radio for the latest reports.

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Mr. E. came back on Wednesday to check on his cat. He was not sure if it was inside or outside the house as no one had been at home when their area was evacuated.

The police let him through the perimeter checkpoint and took his driving licence while he was inside. Mr. E. was out again in 15 minutes. He had no fears about the danger.

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Mr. N.'s son entered the evacuation zone unseen, at night. He borrowed a canoe and paddled across the Credit River to his home which was just on the other side. He collected the family's tickets to the ballet for the following evening and paddled back across the River. No one stopped him.

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Continued. . .

Mrs. W. went back to her apartment about 6 P.M. on Sunday to fetch her cat and some clothes. She found a way to enter the evacuation zone without being seen by the police. It was no problem.

It was lucky that she did go back because she discovered another tenant and her daughter who were still in the apartment block. They were unaware that anything had happened. In her block, the police had not gone door-to-door but had used loudhailers outside.

They all left together in Mrs. W.'s car.

After Wednesday, 13 of the people contacted were successful in entering Zones 1-8 near the accident.

Overall, 27 of the 37 attempts (some families tried more than once) that were investigated by the Study Team were successful. Police allowed people in to collect clothes, and to see their pets, despite the Ontario Humane Society (OHS) Emergency Feeding Programme (Section 6.11). Some of the pet owners did not know about the feeding programme or could not contact the OHS, but most did. They were still concerned about their pets, because they were very young animals, or were thought by their owners to be particularly vicious to strangers, or very sensitive to loneliness.

There were some ingenious, and successful, attempts to enter the evacuation zone without the knowledge of the police. Some boys walked along the railway tracks; another boy borrowed a canoe and paddled across the Credit River - all to get a family's tickets to the ballet.

The police did turn many people back, but even so, it is likely that between 1000 and 4000 people were going in and out of the evacuated zone each day after Monday, 12 November. Most of these people had no more valid reasons to enter a restricted area than did many thousands of others; they were simply more persistent.

The numbers of people allowed in had several effects:

- (a) they absorbed much police time;
- (b) they increased the number to be evacuated again if the situation at the accident site worsened suddenly.

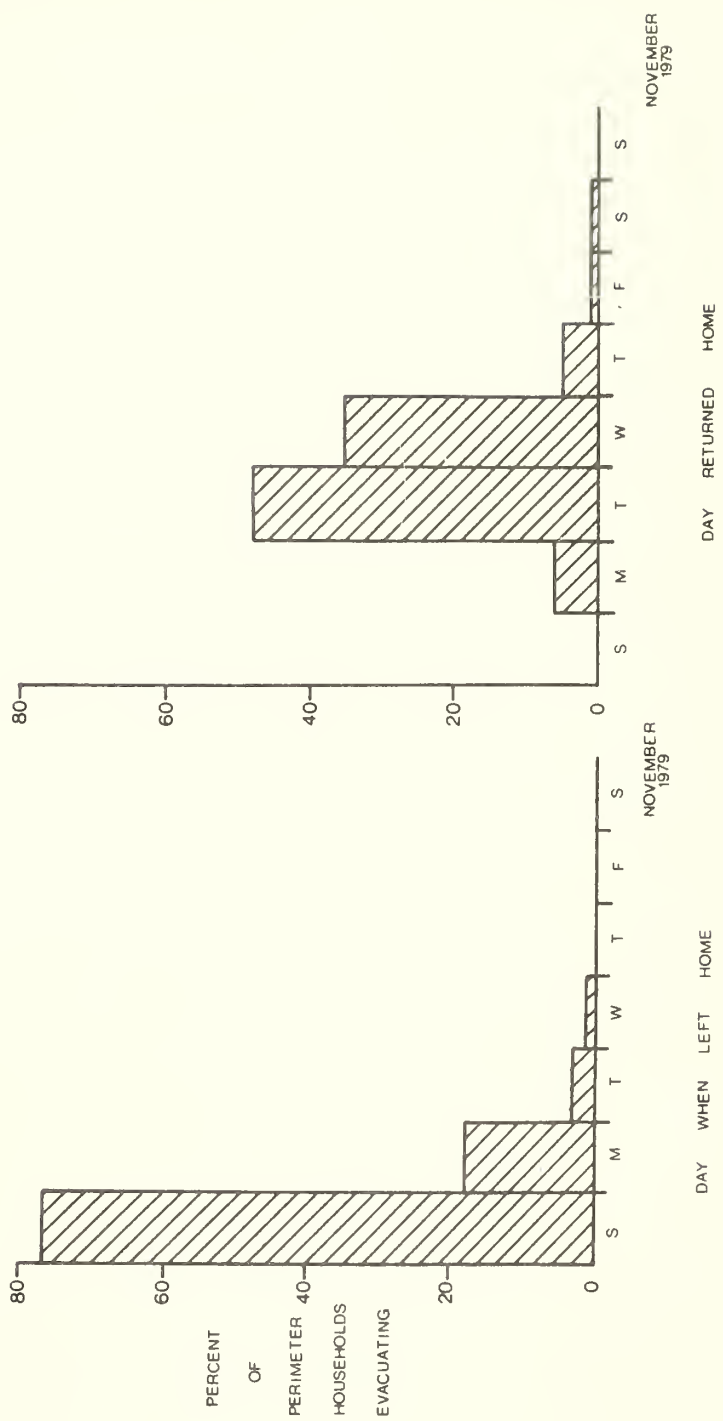
### 5.8. PEOPLE ON PERIMETER OF EVACUATION ZONE

Families living north of Burnhamthorpe Road were separately surveyed to find out the effects of the evacuation on people just beyond the boundaries. Three areas were surveyed (Figure A-1), located between 4 and 8 kilometers away from the accident. Overall, 59% of households report having completely evacuated. In an additional 4%, only part of the family (mainly mothers and children) left. There are no significant differences between the 3 areas in the numbers who evacuated compared to those who stayed at home, although they were different distances away from the accident.

Most of the families were together at the time of the accident (71%). Some of them went out to look at the derailment and then returned to bed. The majority (77%) of those who evacuated decided to leave the following day (Sunday, 11 November). Almost all the others left on Monday, 12 November (Figure 5.11). Most of these families did not expect to be away for more than one day and did not take any overnight things. They tried to return on Sunday night and Monday but were refused entry by police because of the need to go along the evacuation perimeter road to get home. They were kept out of their homes for 2-3 days by the roadblocks set up around the evacuation zone boundaries although some did argue their way through.

The 59% who decided to leave did so after they knew that chlorine gas was involved. The decision, at the time, did not appear to involve loss of work or additional expense because most people expected to return after visiting friends and relatives for the day. It was not a decision to evacuate for several days although that is what it turned out to be.

FIGURE 5.11 VOLUNTARY EVACUATION ALONG THE NORTHERN PERIMETER OF THE EVACUATION ZONE





The reasons given by the people who left were mainly related to their concern about the risks (Table 5.15). In addition, 14% of those living just beyond the evacuation zone thought they had been told to go. These two perceptions are linked to the proximity of the accident (people were not reassured about the "safe" wind direction) and the evacuation of the Square One Shopping Centre north of Burnhamthorpe Road.

On the other hand, people who decided to stay, largely did so because they knew that they were not told to evacuate (53%) and not because they believed that there was no risk (14%) (Table 5.15).

Table 5.15. Reasons given by perimeter people north of Burnhamthorpe Road, who did, and did not, evacuate

(a) <u>did evacuate because:</u>	<u>percent</u>
Worried in case of danger	34
Believed they were told to go	14
Because near evacuation zone	11
Saw others go	9
Concern about pregnancy/children	8
Concern about health	6
Other reasons	<u>18</u>
N = 126	100%
(b) <u>did not evacuate because:</u>	
Not asked to evacuate	53
Not at risk	14
News reassuring	10
Have no children	3
Housing evacuees	3
Nowhere to go	2
Other reasons	<u>17</u>
N = 74	100%

5.9. ROLE OF INFORMATION AND COMMUNICATION  
IN THE PUBLIC RESPONSE TO THE EMERGENCY

5.9.1. Information characteristics of the emergency situation

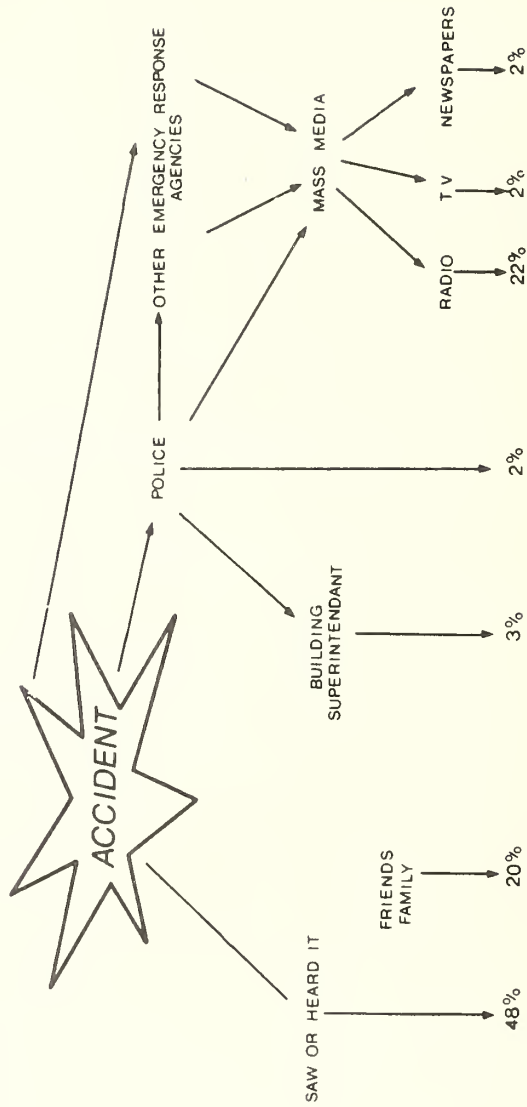
The derailment at Mavis Road announced itself to thousands of Mississaugans. Fifty percent of the 75,500 households which would be evacuated and many others heard or saw the accident and were immediately aware that something was amiss. At first, most people perceived only the danger from explosions and fire, and were unaware that any gases such as chlorine were involved. They did not know that it was a derailment, but simply that it was in their neighbourhood. Many thought that an industrial plant was involved.

Of the remaining 37,750 households, the majority (32,400) learnt about the accident the following morning. Only 6% of all households did not know about the derailment 12 hours after it had happened.

Of the people who did not see or hear the accident, most (43%) learnt about it the next day on their radios. Others (24%) heard about it from another member of their family. Another 10% were surprised to hear about the accident when they were asked by police, or by their apartment building superintendent, to leave between 02.00 and 08.00 hours early on Sunday morning.

Figure 5.12 illustrates the information flow pattern through which the public learnt about the accident. It shows that the information setting for the evacuation was a very favourable one with only one or two communication links came between the source (accident) and half of the public, and almost 50% of the public witnessed the explosions and/or fires for themselves.

FIGURE 5.12 INFORMATION CHANNELS THROUGH WHICH MISSISSAUGA PUBLIC LEARNT ABOUT THE ACCIDENT



In addition:

- (a) 94% of the public knew about the accident within 12 hours;
- (b) the accident was dramatic and looked dangerous;
- (c) people had heard of chlorine and knew that it was a 'poison gas'.

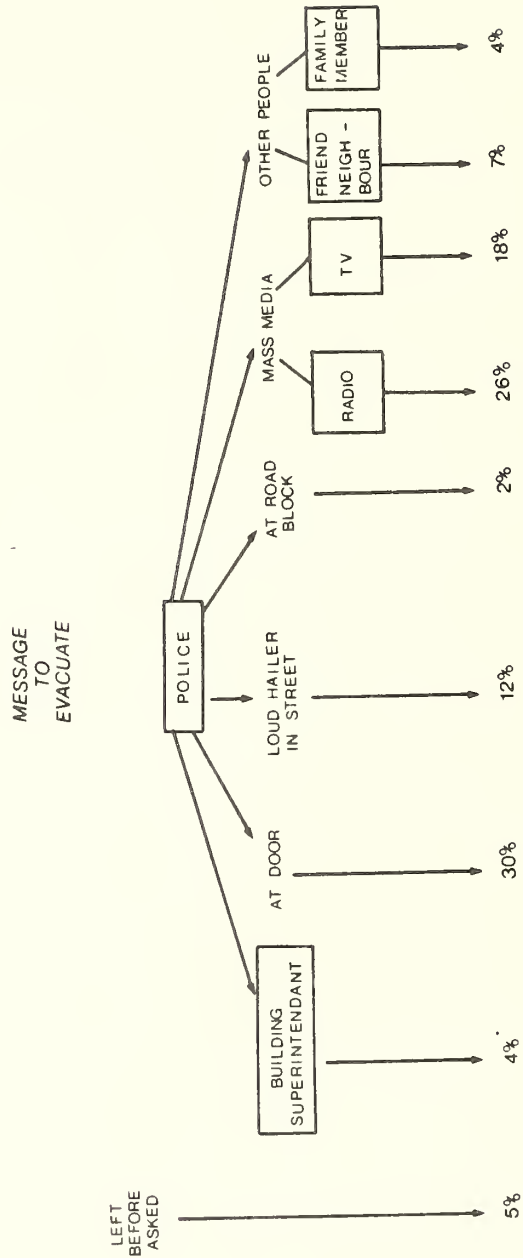
In general, the residents of Mississauga did not need to be persuaded that there was good reason why they should evacuate their homes. The information about the derailment was spread among them rapidly and accurately. Rumour had little chance to develop except one short-lived rumour on Sunday morning that the train had carried PCB's (polychlorinated biphenyls - a carcinogen).

#### 5.9.2. The message to evacuate

Figure 5.13 illustrates the information channels through which Mississauga residents learnt about the order to evacuate. Usually only one or two links were involved: the police interacting directly with the public (43%); or the police message relayed through radio (26%) and television (18%). When people heard the message directly from the police at their door or by a loud hailer they perceived the danger as immediate and left quickly. When they heard the news on the radio or television, or when they were contacted by friends and neighbours, many sought to confirm the message by checking it through another channel. They would check friends' reports against the media or would try to telephone someone in charge; they would cross-check TV reports with radio. As the messages coincided, the public was left with little doubt, and left their homes.

The public was also encouraged to leave by seeing neighbours leave, and the presence of police roadblocks helped to convince them that the situation was a serious one. Thus conditions favouring a rapid and uniform public response

FIGURE 5.13 INFORMATION CHANNELS THROUGH WHICH MISSISSAUGA PUBLIC LEARNT ABOUT THE ORDER TO EVACUATE



to an evacuation order were present: few intervening links, consistency of message between channels, and the availability to the public of alternative channels to allow them to cross-check information.

#### 5.9.3. Private Communications prior to evacuation

Almost all households in Mississauga had their own telephone and every household had nearby access to one. Telephones formed a vital link between evacuees and their friends and relatives. The survey results and follow-up interviews indicate that between the time of the accident and when the families left their homes, there were several telephone calls made to and from each household.

Outgoing and incoming telephone calls were made:

- (a) to pass reassurance that the family was well, and to exchange news,
- (b) to arrange emergency accommodation with friends and relatives,
- (c) to seek more information about the accident and about what to do.

The control sample in Don Mills were asked about their attempts to contact people inside the evacuation zone. Forty percent said that they had friends in Mississauga. Of those with friends, 43% tried to contact the evacuees they knew when they heard about the emergency. Most of these contacts (85%) were by phone from outside to inside the evacuation zone. Only 3% were phone calls initiated from the other direction. It can therefore be hypothesized that attempts to phone each household in Mississauga were made by a third to half of their friends within the Metro Toronto area. For 75,500 households, the total number of private incoming calls alone must have been enormous.

Calls by evacuees to authorities or to voluntary agencies to seek further information, advice or reassurance were the least successful. Evacuees report that they often could not get through, and when they did the person on the other end of the line did not help them very much. This problem relates both to the overburdening of some lines (and people) and to the types of information requested--some people wanted to know before their evacuation zone was officially declared whether they would be evacuated; others wanted to know whether buses would be available; relations wanted to know where individual people had gone. At the time there was insufficient information available anywhere to answer these requests.

#### 5.9.4. Information during the evacuation

Once evacuation had been announced and while people were away from their homes, their information needs centred around seven topics:

- what was happening at the accident site;
- the amount of danger;
- when they might be evacuated;
- when they could return;
- what had happened to people they were concerned about;
- the welfare of their pets, especially those left behind in the empty homes;
- the security of their property.

Table 5.16 indicates how far all evacuees, and those using the Centres, felt that these needs had been met. There are some significant differences between the two groups.

Evacuees, as a whole, were most satisfied with the information they received about what was happening at the



The search for information.....

Mr. and Mrs. F. are both graduates with professional careers. They have one small child. The family live near the outer edge of the evacuated area.

When they first heard that their area might be evacuated, they called the police and were told to leave immediately (Sunday afternoon). They were not given any further details, and did not ask for any.

They were allowed back to their home on Wednesday but felt on alert, awaiting a call to re-evacuate. Mrs. F. phoned the police for advice but could not get through. She was concerned that radio reports were not up-to-date. A little later, she tried the Fire Department and got through. She asked what she should do in the event of a gas explosion for herself and her baby. She remembers that they said, twice, "Lady, there's nothing you can do".

This reply frightened her and she ran around packing things again. On the radio, she heard Mr. McMurtry and Mayor McCallion discussing the possibility of a chlorine gas release. They wouldn't be talking about it unless it was a real possibility. But no one could tell her, if there was a bus to take her out in a hurry, or how to protect her baby. She was scared that she did not know what she should do if something went wrong. She desperately needed more information.

"If I live to be 200", Mrs. F. remembers thinking, "I'll never forget this anxiety".



Table 5.16. Evaluation of Information available to them during the emergency by all evacuees and those in evacuation centres

Did not have enough information about:	All evacuees (N=504)	Those in evacuation centres (N=175)
	%	%
What was happening	21	39
Amount of danger	36	47
When you might be evacuated	41	54
When you could return	58	28
People you were concerned about	28	46
Your pets left behind	47	57
The security of your property	42	49

site, and about the welfare of family and friends. This reflects detailed and accurate media reports on the accident scene, and the fact that families were generally evacuated together. They were less satisfied with the information available to them about what was happening at their homes with regard to their pets and property security (over 40% felt that they did not have enough information).

The area where most evacuees would have liked more information related to their own travel arrangements--when to move out of the area and when they could return; nearly 60% of all evacuees were dissatisfied with information about when they might be able to return.

Evacuees staying in the Evacuation Centres had different information problems. Fewer of them felt that they knew enough about what was happening at the accident site and about the degree of risk. They were also less satisfied with the information they had about missing relatives and about their pets. More of the people in the evacuation centres, however, felt that they were well informed about when they could return.

The differences in the degree to which evacuees' information needs were satisfied are what might be expected from their different situations: evacuees staying with friends and relatives in private homes not only had access to radio and television news but could easily use private telephones to contact other people whereas for people in the centres, telephones were more difficult to find. Evacuees in private homes, however, had to organize their own transportation to their temporary shelters and wanted accurate and rapid information about when evacuation zones would be closed and opened. In contrast, people in the main evacuation centres were relatively close to home and some received

direct announcements about the re-entry zones, as well as hearing through the news media. Overall, the evacuees who were staying in private homes and in hotels came closest to having their information needs fulfilled.

During the evacuation, evacuees believed that they received the most accurate information from radio and television. The most frequently mentioned radio station was CFRB (specified by 11% of evacuees); the most mentioned television station was the community service, Channel 10, (mentioned by 10% of evacuees). More people felt that radio was the most reliable medium for up to date and accurate news reports (65% compared to 33% for television). Newspapers were relied upon by only 2% of the evacuees. This reflects the public need for up-to-the-minute information, which radio provided, and the fact that they could keep tuned to a radio all day with less interference to their daily activities than with a television. Some people complained of the repetitiveness of television news programming, particularly the constant re-runs of early film of the accident. Radio was most used by people wanting to know when and how to return to their homes.

#### 5.9.5. Public evaluation of information

In retrospect, more evacuees felt that they were getting the real story during the emergency, than did not (Table 5.17 ). However a third of the sample asked were not so sure. People living outside the evacuation zone were more likely than the evacuees to believe that they had received the real story. Evacuees in the Centres were the group least likely to have believed all they were told.

Table 5.17. Responses to question:

"Did you feel that you were getting the real story during the emergency?"

	Yes	No	Not Sure
	%	%	%
All evacuees (N=504)	55	16	28
Those in centres (N=175)	44	25	31
People on perimeter (N=200)	63	19	18
Control group (N=200)	68	16	16

As has been discussed elsewhere in this report, a major information problem for the evacuees was the lack of any warning or advice to be prepared for a stay away longer than a few hours. Most evacuees had time to prepare for overnight or longer stays away but did not realize that it might be necessary.

In the surveys the evacuees were asked specifically if, knowing that the length of the evacuation could not be predicted, they felt that they should have been warned of the possibility that it would last for several days. The response was overwhelmingly 'yes'. Nearly 90% of all evacuees and those using Evacuation Centres felt that despite the uncertainty they should have been warned. Such advice, they felt, would have reduced the numbers who left without enough clothes, medication and other supplies, and who thereby suffered additional inconvenience and anxiety.

## **Chapter 6**

# **SOCIAL IMPACTS**





## 6.1. INTRODUCTION

The Mississauga derailment did not cause any deaths or major injuries. However, for the people involved, there were many ways in which the emergency affected their lives.

This chapter documents the social impacts on different groups of people such as the sick, families with children, senior citizens, pet owners, and people using the Evacuation Centres. It also summarises all the known health effects of the emergency and the evacuation experience. One generalised impact of the experience has been to increase the public's level of awareness of risks (Section 6.10).

The chapter is based on three main data sources:

- (a) the public surveys carried out by the project;
- (b) in-depth taped interviews with Mississauga residents;
- (c) interviews with physicians, pharmacists, church leaders, and many health and social service organisations (governmental and non-governmental). These are listed in the Acknowledgements.

Where statistical data are presented, they are from the public surveys. Other statements are based on the interviews with residents or on expert opinion.

### 6.1.1. Social dimensions of the emergency situation

Several aspects of the circumstances surrounding the derailment influenced the nature and degree of the social impacts.

The accident occurred at midnight on a Saturday evening, in winter. This fortuitous timing meant that most of the people who were to be evacuated were already at home and together. As has been described in Chapter 5, families who were together at the time of evacuation, left together

and stayed as a family unit. Their uncertainty and consequent concern about each other's welfare was therefore minimised. In contrast, those families who were separated spent more effort in becoming reunited, even where this meant delaying their evacuation from the area. They were also more anxious until the family were back together. Had the evacuation taken place on a weekday when families were split up with some parents at work and children at schools and day care centres, the social impacts would have been quite different, and probably far greater.

Secondly, the accident did not kill anyone. Evacuees were not fleeing from a disaster but were removing themselves from a potential danger. The situation was one which encouraged orderly, rational response rather than a horror-struck mad scramble.

Thirdly, the residents of Mississauga are largely grouped into small, nuclear families with incomes around \$40,000 per year. Many heads of households are in professional and managerial occupations. Most residents speak English as a first language and almost every household owns at least one car, and has communication via radio, television and telephone. These social and economic characteristics helped the evacuation to proceed smoothly and to reduce the negative impacts of the experience.

Thus, the nature of the accident, its timing, and the characteristics of the population at risk, all favoured a successful outcome with minimal social impacts. On the other hand, there were several institutions, including nursing homes and three hospitals which had to be evacuated and which could have produced major social and health problems.

## 6.2. HEALTH EFFECTS

Most of the health effects of the emergency were minor

and temporary. In general, evacuees received good health care, especially those particularly at risk such as hospital patients and people in institutions. This is the consensus of the many medical and social welfare experts contacted in the course of the study. It is also corroborated by survey data on the short and long term effects of the emergency on the evacuees (Table 6.14). Fourteen percent of the evacuees questioned in November 1979 report experiencing anxiety (worry) as a result of the derailment. By August 1980, 11% reported that they were more nervous since the accident. Increased anxiety and nervousness is the only health effect to be reported by more than 1% of the evacuees.

The health effects discussed below are therefore rare when considering the total number of people evacuated (226,000). They are recorded, not because they were significant in the Mississauga emergency, but because some of them are associated with organisational deficiencies in providing access to medical facilities. By considering these problems for future emergencies, many of them can be anticipated and resolved.

The health effects of the emergency can be considered under nine headings:

- (1) eye irritations;
- (2) respiratory problems;
- (3) chest pains;
- (4) food poisoning;
- (5) psychological disturbance;
- (6) anxiety and psychosomatic illnesses;
- (7) existing health problems exacerbated by lack of access to medication or medical attention;
- (8) health conditions exacerbated by lack of privacy and access to personal hygiene in crowded emergency evacuation centres;
- (9) injuries such as bruises, sprains and broken bones.

#### 6.2.1. Eye irritations

A few people complained of eye irritation, particularly those living near the accident site and those returning to basement apartments on Tuesday, afternoon (13 November) before the advice to ventilate homes was announced.

Generally, it appears that these people sought advice and medication from their pharmacists rather than from their general practitioners. No long-term eye irritation problems are known.

#### 6.2.2. Respiratory problems

Respiratory and heart conditions were mostly of concern to senior citizens and others who already had such problems. Many of them checked their health status with their own doctors before signing the waiver on the CP Rail claim form for compensation. People with existing respiratory problems who lived near the accident site also complained but appeared to suffer no long term effects. One General Practitioner believes he may have seen more patients with respiratory problems, but November is a common time of year for coughs and chest problems to emerge. A Respiratory Specialist reported increased symptoms after the evacuation in many of his patients with chronic lung disease. He believes that these symptoms were more likely to be caused by the stress of the evacuation than by chlorine or other gases.

#### 6.2.3. Chest pains

Seven people were taken to hospital on Wednesday, 14 November, complaining of shortness of breath, dizziness, chest pains and nausea. Others complained to their doctors or pharmacists about chest pains. Generally, these people had already experienced chest problems and/or were anxious about the emergency.

#### 6.2.4. Food poisoning

Seven cases of food poisoning were reported to the Peel Region Health Department on November 14. Householders returning to their homes after the evacuation were given the following advice about left food, "When in doubt, throw it out". Likewise, businesses were asked to check for spoiled food. No long-term effects were reported.

#### 6.2.5. Psychological disturbance

The Distress Center received no additional calls for help that can be attributed to the emergency. However, at least one person, a teenager, suffered a profound personality disorganisation from the accident. He was close to the accident site at the time of the explosion and fled in terror, believing he was dead. This patient had subsequent anxiety attacks and problems in coping with his school work and personal relations. However, he recovered within a year.

Most of the people who experienced psychological problems were children. Some of these children already had histories of sleeplessness and personality difficulties. They were already vulnerable to stress and the accident and evacuation provided a focus for the stress. About ten children were referred by their paediatricians to a child psychiatrist. The most common problems were sleep difficulties and nightmares. They would dream frequently of fires and dying. Some young children (3-6 years) had seen the fire and flash and were frightened by the accident itself.

The problems persisted for some months but are not considered to be long term. Some families even reported improved behaviour on the part of their children and some 'difficult' children had learnt through the crisis to be more cooperative within the family.

#### 6.2.6. Anxiety and psychosomatic illnesses

Increased anxiety was the most widespread health effect of the emergency. It particularly affected families with young children, separated families, people needing special assistance, and those already prone to psychosomatic illnesses. However, most people who suffered anxiety about the danger, the disruption to routine, or lack of news about their relatives, pets or home, did for a short time only.

During the emergency, the majority of evacuees (64%) report feeling some concern about their families' safety (Table 6.1). Generally, this concern occurred at the beginning, when they heard or saw the accident, or when they were asked to evacuate and realised that the situation was serious.

Both the survey results and the in-depth interviews with evacuees show that the women in the families were more concerned than the men (Chi-square test significant at .005 confidence level)<sup>1</sup>.

Concern was also heightened if there were young children (0 - 9 years old) or if the mother was pregnant (Chi-square test significant at .001 confidence level). Concern was not significantly increased if the family only had older children, nor if the size of the household were larger.

The main reasons given for concern during the emergency were the danger, the uncertainty and the health (often specific health problems) of family members. On the other hand, people who said they were not concerned, based their judgement on two main beliefs: that they were a safe distance from the accident, and that the authorities had everything under control (Table 6.2: differences significant at 0.001 confidence level). It is interesting to note that, as a group, those who were unconcerned and believed themselves to be a safe distance away, were not

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<sup>1</sup> This test is explained in Appendix 3.



Table 6.1. Responses to "At any time during the emergency, were you seriously concerned for your own or your family's safety?"

	<u>Yes, very concerned</u> %	<u>Yes, concerned</u> %	<u>No, not concerned</u> %
All evacuees (N=504) .	31	33	35
Evacuees in centres (N=175)	41	28	29
Control group (Don Mills) N=200	9	25	65

Table 6.2. Reasons for degree of concern felt during the emergency.

<u>Reasons for concern/no concern</u>	<u>Very Concerned</u> %	<u>Concerned</u> %	<u>Not Concerned</u> %
Danger	35	35	6
Uncertainty	19	24	1
Family health	29	21	-
Distance to accident	9	7	48
Authorities had control	-	-	22
Evacuation out of control	1	3	3
Not worried	-	-	8
Danger exaggerated	2	1	4
Other	5	9	8
	<u>100%</u>	<u>100%</u>	<u>100%</u>
N=504			

actually any farther away than people who were concerned. What is important is whether they perceived the distance to be a safe or dangerous one.

For most people, this anxiety lasted only as long as the emergency itself. Pharmacists in the area report no noticeable increase in requests for mood-altering drugs like Valium, either immediately after the emergency, or later.

Some anxiety among the elderly and those receiving care in hospitals, nursing homes and home care was reported by medical and nursing practitioners but generally these cases were mild and short-lived.

Psychiatric patients appear to have been no more anxious than others about the evacuation and for some psychiatric patients, the effects were more positive than negative. Church ministers likewise report only a few short-term and relatively mild cases of anxiety among those who came to them for help.

Most doctors and pharmacists contacted felt that many of the illnesses reported to them were psychosomatic problems induced mainly through anxiety. These included shortness of breath, asthma attacks, chest pains and respiratory problems. These problems generally disappeared within days or weeks of the end of the emergency. One doctor reported fewer psychosomatic problems during the emergency, which he attributed to higher community and family morale.

Anxiety therefore was probably felt for a short time by many people in Mississauga, particularly during the emergency itself, and by people who were more prone to anxiety through their own health status or their family situation. It does not appear to have led to many more serious, or more long-lasting health problems.

6.2.7. Existing health problems exacerbated by lack of access to medication or medical attention.

These problems ranged from generalised anxiety in patients who felt they would not be able to get in touch with their doctors if they needed them, to specific conditions brought about by lack of medical attention or medication. For example, doctors reported patients with high blood pressure and diabetes who were at risk because medication and diet were interrupted when they were evacuated.

Some people did not take any medication with them. Others, even those needing regular medication, took insufficient supplies. These included women on birth control pills. Nearly 12% of the households surveyed (representing some 8750 families) specifically mention that medication left behind caused them problems during the evacuation. Patients discharged from Mississauga General Hospital were given only 3 days supply of necessary medication and ran out of supplies before the evacuation was over. Three days supply was considered by the hospital staff to include a safety margin because they also expected that the evacuation would last only one day. Patients with chronic disorders, who would not have been sent home if the hospital had anticipated the possibility of a week long evacuation, were sent home. Their families had trouble giving them proper nursing after 2-3 days.

The problems were caused by:

- (a) evacuees and discharged hospital patients taking insufficient supplies of regular medication with them;
- (b) a breakdown in communications between doctors and their patients.

Appointments were missed and others could not be made because both patients and doctors were evacuated. New doctors were reluctant to prescribe medication without reference to the patient's medical records;

- (c) doctors and their answering services having to evacuate their offices and leaving their medical records behind.

Doctors were refused re-entry into the evacuation zone to retrieve medical records.

(d) people remaining within the evacuation zone;

Doctors were refused entry into the zone to give medical assistance to those who remained behind, although one doctor at Mississauga Hospital stayed inside the evacuated area and was given access (with a letter of authorisation) in and out of checkpoints on the perimeter. The Victorian Order of Nurses also were allowed to visit people requiring home care who lived in the evacuated area but near the perimeter.

Generally, it was expected that people voluntarily staying in their homes should leave the evacuation zone if they required medical attention. It is not known if any of these people became sick and whether they decided to stay or leave. No major health problems were reported among the people who stayed behind in the evacuated area.

6.2.8. Health conditions caused by lack of privacy in emergency quarters.

These problems were reported to their doctors mainly by women who were in Evacuation Centres. Some of them had pre-existing conditions, such as vaginal infections, which were temporarily made worse by a lack of privacy for personal hygiene. The International Centre, for example, had only twenty to twenty-five toilets and washbasins and no showers for 1000 evacuees.

There was also concern among medical staff in attendance at the evacuation centres that people bringing infectious diseases with them would lead to outbreaks of disease. For example, two children with scarlet fever (later found not to be contagious) were reported at the International Centre, and one doctor reports a couple who may have caught scabies at an Evacuation Centre. However, no major public health problems arose at the Evacuation Centres.

For many people, access to proper health care was better at the centres than elsewhere, because medical help and medication was available through the St. John Ambulance and Public Health Nurses located in all centres. Local pharmacies supplied missing medication and seriously ill people were taken directly to hospital.

#### 6.2.9. Injuries

A few minor injuries were reported during the emergency, particularly among the people working at the accident site. They included bruises, sprains and minor fractures. There is no evidence, however, that an unusually high number of injuries was sustained among the general public.

### 6.3. PROBLEMS IN DELIVERY OF HEALTH CARE DURING THE EVACUATION

Although no deaths or major health problems can be directly attributed to the emergency, it is clear that the health care system for people in the area was vulnerable and major problems could have arisen. The two main sources of difficulty in health care delivery were:

#### 6.3.1. Inadequate advice to people to be prepared for the possibility of an evacuation of several days.

Many families including some with people medically dependent on regular medication were at risk because they did not take sufficient medical supplies for the amount of time they were eventually evacuated. Many of these people did not just forget to take medication; they believed that they had sufficient (as did the hospital authorities) for one day plus a safety margin. Most of the evacuees had several hours between the time of the accident and being asked to evacuate. They could, if they had been advised, have gathered together medication, prescriptions, for the time they were away.

### 6.3.2. Lack of any official plan, or action, to provide continuity of doctor's services to the general community.

Because doctors, patients and doctors' answering services were all evacuated, normal communications between them broke down. In addition, doctors were separated from their patients' medical records. No emergency plan to deal with this situation existed and no action was taken by people at the Command Post to set up an emergency communications centre for doctors and patients.

Doctors became very frustrated and patients became anxious and in need of medical supplies and attention. By the evening of Wednesday, 14 November, an emergency communications for doctors and patients was set up at Apple Mills Clinic by one doctor and this telephone number was given out to police, T.V., radio and newspapers. However, other doctors report that they did not hear about the clearing house system and did not use it.

The Mississauga emergency demonstrated clearly the need for an emergency communications system to link doctors with their own patients in addition to emergency hospital and public health services. This need was underscored by the fact that most of the evacuees were not in evacuation centres where they had direct access to medical personnel but were scattered in homes and hotels throughout Metro Toronto and Southern Ontario.

## 6.4 FAMILIES WITH YOUNG CHILDREN

Nearly a third of the households surveyed had children under 10 years old. Most of the parents were professional or managerial people in their thirties with family incomes between \$15,000 and \$30,000. Like most people in Mississauga, they generally owned their own homes.

At the time of the derailment and subsequent explosions, parents of young children and pregnant women experienced varying degrees of anxiety about the danger. As news of the chlorine gas spread throughout Mississauga, they became increasingly anxious.



A pregnant mother.....

When the accident occurred, Mr. and Mrs. G. had an 18 month old son and were expecting a second child. They live close to the lakeshore and only heard a noise at midnight on Saturday to which they paid little attention. Unaware of the emergency, they drove to Milton for Sunday brunch and heard about the accident there. Still not really concerned, they returned home about 2 P.M. and phoned the police. They were told to evacuate immediately.

Mrs. G. began to get worried. She took two green garbage bags and filled them with enough clothes for the three of them for a week. Her husband didn't think they would be away that long, but Mrs. G. was determined to be prepared for any eventuality. It was an offshoot of travelling with a child.

Hearing the radio reports in the car and seeing the ambulances made everything seem more serious as they drove to their Aunt and Uncle's home on the other side of Etobicoke Creek. Everyone seemed to enjoy the visit but Mrs. G. was glued to the T.V. and radio for more news.

On Wednesday, they were allowed to go back home. It was funny to see some homes with lights on and windows and doors wide open, being aired, while others were in complete darkness.

The worst day for Mrs. G. was Thursday. Her husband went off to work on Oakville in their car. She felt stranded. Her neighbour felt the same without a car and the two of them worried about how to get out of the area again quickly. You can't call a taxi and the police are too busy. There's no way to get out quickly without a car.

Thursday was so awful that Mrs. G. and their son accompanied her husband to work on Friday. The stress of waiting to see if they would be re-evacuated was the worst part of the whole experience. Mrs. G. also worried about the effects of gas on her unborn baby. Shortly afterwards, she did have a miscarriage but she doesn't attribute it to the emergency.

Today Mrs. G. is still concerned when she sees trucks on the highway with "flammable" signs. She feels we play Russian roulette with ourselves and with our environment.





Parents of children with respiratory problems, asthma or allergies were worried that the gas would aggravate their childrens' existing conditions. For most of these parents, the evacuation relieved their anxieties. There were a few who were also worried about long-term health effects. At least one pregnant mother who smelled gas fumes while driving from her home worried about losing her baby. She said that she thought she was going to have a miscarriage in the car.

The impacts on the children closely paralleled those on their parents. Some children became anxious in response to their parents' concerns. Others were too young to understand that there might be danger. Many children slept through the explosions but a few young children, especially those nearer to the site, became frightened by the fire and explosions. These children, once they were evacuated, were generally happy again. Older children, aged 9 and up, tended to find the whole event exciting and few showed any fear.

During the evacuation, most children enjoyed the change in routine and the visits to relatives and friends. Their parents, however, were concerned about disrupting their hosts' lives and they felt stressed by the cramped conditions and fear for Grandmother's china. Even so, they say that they would go back to the same temporary homes in similar circumstances. Some parents had to miss work to stay and look after children whose school or day care centre was closed and some parents reported losing pay.

By and large, parents did not report any unusual health problems for their families during the evacuation. Some said that their children had sleeping problems for a time (usually days or weeks only) after they returned home. Children also tended to associate any siren or fires with the emergency, but were not apparently upset by this association.

Some of the major difficulties were encountered by parents

who were separated from their children. This generally occurred not at the time of the accident, but sometime later during Sunday morning. Unaware of the impending evacuation, some parents went out on Sunday and found they could not get back in. Many had arguments with the police and were determined to get around the barricades to be with their children. One man said, "I would have got home any way I could, even if I had to walk". These parents expressed anger that, when they left the area to go to church or to visit friends, they were not warned by the police that they might not be able to return.

The families in the surveys who had young children do not feel differently from other evacuees about the way the emergency was handled or about its impacts on them. However, they are much more likely to say that they are now better prepared for any future emergency (Chi-square test significant at  $< 0.001$  confidence level). They almost all said they would take enough clothes and games for at least several days next time.

Parents with young children did suffer the additional anxiety of concern about their children and the extra work of looking after them in strange places. The stress on parents with several young children is revealed also in our survey results showing that they felt more money was necessary to compensate them (Chi-square test significant at  $< 0.001$  confidence level). However, apart from a few children who suffered some emotional disturbance for some weeks afterwards, the social and health impacts of the emergency on this group differs little overall from the impacts on the general population. No major or long-term health effects on children or their parents was uncovered in the survey or in the follow-up interviews.

The evidence does suggest, however, that parents separated from their children will defy any evacuation orders to reunite themselves with their children. In the case of Mississauga, this situation involved only a handful of parents. Had the accident occurred during a weekday when parents are at

work and children are at school, the numbers of parents trying to reach their children could have run into thousands. It would present a very different and more difficult evacuation management problem than the task posed at Mississauga.

#### 6.5. PEOPLE REQUIRING SPECIAL ASSISTANCE TO EVACUATE

##### 6.5.1. People in institutions

The Mississauga emergency involved the evacuation of a number of residential institutions such as nursing homes, children's homes and homes for the aged. It also required the total evacuation of three hospitals: Mississauga Hospital, Oakville Trafalgar Memorial Hospital, and Queensway Hospital. Mississauga Hospital had 479 patients and includes Emergency, Surgical, Psychiatry, Obstetric and Paediatric Departments with a nursery for premature babies (see Section 4.4).

There were many elderly people in various states of health who had to be moved during the evacuation, as well as hospital patients and children in care. All of these people required assistance to evacuate and the experience was more of an upheaval for them than for the other evacuees.

Patients from Mississauga Hospital were either transferred to other hospitals by ambulance (186 patients) or were discharged and sent home in the care of relatives (262 patients). Of 41 psychiatric patients, 30 were out, or were sent out, on passes; one was sent home and another 10 were transferred to another hospital. Patients and hospital staff reacted calmly and efficiently to the evacuation order and no major problems were reported. The main impact on hospital patients was anxiety among those sent home and out on passes about their medication running out after three days, and about their inability to get in touch with their own physicians (Section 6.2.7.).

For the elderly in nursing homes, some found the experience exciting and looked upon it as a holiday while others were clearly distressed and disoriented and said that they wanted to die. Having to leave at night rather than during the day dramatically increased the trauma of the move. For example, the Sheridan Villa Nursing home was evacuated at 21:00 on Sunday, 11 November, and the patients were not settled into their new quarters until 01:00 on Monday, 12 November.

While they were in their emergency homes, elderly nursing home patients received much attention and were kept busy with the help of volunteers. At the same time, anxiety was minimised by having familiar staff in familiar uniforms look after them in the temporary quarters. Nursing home staff noticed that many elderly patients became more dependent and "regressed" during the evacuation. The less senile patients were the most anxious and would probably be the most affected if they had to go through such an experience again. Their anxiety, however, was over the move and the disruption to their routine rather than over the danger.

For the handicapped, the evacuation made them more aware of their vulnerability and dependence on others. Emergency quarters lacked the special facilities that they were used to and emphasised their inadequacies.

### 6.5.2. People receiving Home Care

Patients receiving home care while recovering from illness or surgery appeared to their nurses to receive some setbacks to their progress in recovery. Two heart attacks were recorded by the Peel Region Health Service Home Care Program but these cannot be specifically related to the evacuation. Some patients were weakened by anxiety and received additional physiotherapy to reduce stress.

On the whole, home care patients were happy with the way they were treated during the evacuation. The impacts on them were relatively minor and short-lived; no major health effects were recorded. Generally, the impacts were confined to temporary anxiety and discomfort together with inconvenience of new locations and missed doctor's appointments. Only a few home care patients were reported to be distressed about the evacuation eight months later. For most of them, like the other evacuees, it was a time to stay with friends and relatives for a few days.

The Victorian Order of Nurses noted that the greatest stress was experienced by the early evacuees living closest to the site whom the VON could not contact before they were evacuated. Some home care patients living near the outer boundaries of the evacuation zone refused to leave their homes and the VON went into the area to provide home care for them. For these people, continuity of care by familiar people in familiar uniforms was important in reducing anxiety.

## 6.6 THE ELDERLY

About 5% of the evacuees were elderly people in their 70's and over, and another 10% were in their 60's. As a group they tend to spend more time at home and to have lower family incomes than the other evacuees (68% of those over 50 years who were surveyed report having annual family incomes under \$15,000).

In general, it does not appear that senior citizens suffered significantly more than anyone else in the emergency, merely on account of their age. Many of them who needed help received it from friends, relatives or neighbours. There is evidence that, if anything, they were the most satisfied group with the way that the emergency was handled. They were significantly less concerned about their own safety during the emergency (Chi-square test significant at 0.001 confidence level) and significantly more likely to feel that no money was necessary to compensate them for the experience.

In follow-up interviews, many senior citizens said that they had not claimed any compensation because it didn't seem right or because their expenses were small. Older people surveyed are not any less concerned about long-term effects than are others; nor are they more anxious about the transportation of hazardous goods since the accident.

However, there are two areas of concern regarding the impacts on the elderly:

- (a) Older people were more likely to be on regular medication. They were therefore the group most affected by not knowing that the evacuation would last for several days and that they would need medication with them for this length of time.

It is clear from our interviews with older people and with those caring for them that this lack of medication caused anxiety for many of them. In some cases, insufficient medication was taken; in other cases, the home supply was almost out and the prescription was about to be refilled when the evacuation intervened.

- (b) there were an unknown number of "shut-ins", elderly people living alone who received little help.



An old lady living alone.....

Miss V. lived alone with her dog at some distance away from the derailment site. She was 72 years old. When the accident happened, she awoke to hear a "sonic boom" which shook her house. She got up and looked out of her back window but could see nothing. Her dog started to cry, not bark, but a kind of crying. She did not know what had happened and became worried. She put a light on but no one came to her.

On Sunday morning, she heard about the derailment from CFRB news station on the radio. Later in the morning, her cousin phoned to say he was driving over to fetch her. He tried to do so but was prevented from entering the evacuation zone by the police. By now, most of the neighbours had already gone and it was getting dark. She decided that she would leave by herself the next morning.

Then a neighbour came over and said that she must leave immediately and could go with him. He would give her time to collect any clothes or things to take. Miss V., her dog, her neighbour, and his wife left in his car. They drove up Highway 27 almost to Barrie. At one o'clock on Monday morning, they stopped at a motel and managed to get the last room. They all stayed in one room, including her dog.

Late on Monday, her neighbour drove south again and took Miss V. to her niece's home in Scarborough. She stayed there until Wednesday, 14 November. Her niece looked after her, and her dog, very well. She charged Miss V. nothing and even bought her a bottle of cognac. Her niece received no compensation for the additional expenses and Miss V. did not claim for the one night at the motel because her share was only \$14.

She had trouble trying to get home on Wednesday because some areas were still closed off. The police told her niece who was driving her to take an alternative route.

Today, she feels that the evacuation was perhaps not necessary. She was unhappy at not having a chance of clothing with her and in any future emergency would pack a bag and leave immediately for her niece's home. In retrospect, the actual evacuation upset her less than the uncertainty and the worry during Sunday of whether she should leave or not. She never heard the police come around with a loud hailer and felt if it had not been for her neighbours, she would have been "perfectly neglected".

An elderly couple living near the edge of the evacuation zone.....

Dr. and Mrs. W. were both over 70 years old when the derailment occurred. Two daughters, one son-in-law and two grandsons were staying with them. Dr. and Mrs. W. heard nothing of the accident until the next morning when their daughter and grandsons described seeing the flames. Mrs. W. did not even know where the tracks were and never heard a train on them. The young people were very excited and were laughing and talking about the derailment. Unaware of the impending evacuation for their elderly parents, the young people left, as planned, on Sunday leaving Dr. and Mrs. W. alone again in their apartment.

Late that day, the security officer in their apartment building told them to leave. Dr. W. did not want to go because they were a long way from the tracks and Mrs. W. became worried and packed her own and her husband's overnight bags without his knowledge. People all around them were leaving. Relatives called and offered their homes, if needed. The security man told them again and again to leave, but her husband, who had a heart condition, was reluctant to go. Eventually, he agreed to call a hotel where they had stayed before. They called a cab and left. They had kept the radio on constantly.

Things went well. They had no pets and the hotel cashed a cheque for them. They stayed for three days in comfort, ate excellent meals and relaxed. They had a really good time. Their only complaint was that they had expected only to be away for one night and had not taken a change of clothing. They were glad to return home to their lovely apartment on Wednesday, 14 November. Dr. W. filled out a claim for compensation from CP Rail. He included the \$50 per night for the hotel room and \$14 for the taxis. They did not claim for meals because they felt it was their treat and they didn't want to abuse the privilege of compensation that they had never expected in the first place.

They had no health problems during the emergency but Dr. W. had a progressive heart condition and has since died. On reflection, the wonderful time they had at the hotel during the evacuation turned out to be their last holiday together.

Today, Mrs. W. lives alone in a new apartment. After her husband's death, she found that, unknown to her, he had kept a newspaper clipping file about the derailment and evacuation. For the future, she now keeps a bag half-packed at all times, and has bought a "smoke-bag" which gives you enough air and protection to survive for 20 minutes in a fire.

One group which is underestimated in the surveys, because they do not return questionnaires, is elderly 'recluses' who live alone and generally apart from their neighbours. These people can be in need of home care and medical attention but do not receive it because they do not ask for help and may not be known to social service personnel. They are known by nurses as "shut-ins".

Little is known about the effect of the emergency on these elderly people. Some arrived in evacuation centres, having been brought there by the Red Cross and by neighbours. They tended to be confused and isolated. Nurses in the centres talked to them and found them often anxious but unable to express their concerns clearly. One man had even lost his wife but made no effort to tell anyone until he was approached by a nurse.

Nursing staff identified the 'shut-ins' as a major problem during evacuations.

*They were dumped in the centres, not knowing what's going on, wondering 'who are these people?', 'where's my house?'.....We put all the focus on institutions because there's a great number of seniors there, but we missed all the people who are individuals.... there could have been many seniors who quietly suffered that helpers didn't know about....a difficult and long-term project should be an on-going awareness of shut-ins.*

*Peel Region Public Health Nurse*

Our interviews suggest that among those who did not evacuate were probably a number of 'shut-ins' who were either overlooked by police and neighbours, or who deliberately hid in basements to avoid leaving.

In conclusion, older people in good health, living in their own homes or with their families, did not necessarily suffer greater anxiety or inconvenience than anyone else. The people who really had a difficult time were those who were at home and were handicapped, disabled or had a severe illness. Many of these



people did not want to leave home because of the physical difficulties and exertion involved. Undoubtedly the evacuation was most traumatic for them. A few people suffered specific injuries while away from their familiar and well-equipped home, while others are reported to have suffered non-specific setbacks or a general worsening of their complaints. People differ in their reaction to these impacts; some have given their cases to lawyers to seek compensation; others accept the effects as 'one of those things'.

Older people in Mississauga therefore do not appear to have suffered additional distress during or after the evacuation that can be attributed simply to their age. Poor health and the need for special care would seem to be a more critical factor than age in the effect an evacuation will have on people's well-being.

#### 6.7. NON-ENGLISH SPEAKERS

Although there are non-English speakers in Mississauga, their numbers are relatively small compared to some parts of Metro Toronto. The largest non-English speaking communities are Italian and Portugese. Generally, someone in the family, usually a school-aged child, speaks English and acts as interpreter between the family and the outside world.

During the evacuation, because it was Sunday, these family interpreters were mostly at home. No particular problems of misunderstanding are known to have occurred because people could not speak English. Many of these families had relatives in Toronto and Southern Ontario and most of them stayed with friends and relatives rather than in the Evacuation Centres.

The provincial and municipal social services that usually help non-English speakers did not receive requests for interpreters during the evacuation and do not report any knowledge of particular language or comprehension problems for these families. However, there are no emergency plans known to these

Living by the tracks.....

Mr. and Mrs. V. were at home watching the news on T.V. Mr. V. went upstairs to get into his pyjamas to watch the late-night movie. From his bedroom, he heard the wheels of the train squeal as it went around the bend. The wheels always squeal when the trains go by fast. He shouted to his wife "My God, this guy's flying". Mr. V. heard a thump and thought that the train had hit a car at the Mavis Level Crossing.

Out of the bedroom window, Mr. V. saw a small flame. He put his clothes back on and went outside. There he met his neighbour. At that moment (12:05), the explosion went off. Mr. V. had to put his face straight up to the sky to see the top of the cloud. The blast moved the door jams and his back door flew open, although it was locked. The windows shook and the heat became intense (1-1/2 kilometres away from the accident). Later they discovered cracks in the walls.

Mrs. V. was really terrified. She had also rushed out of the house and was scared of being trapped. The flames were going up right over the top of them and disappearing over the houses. It looked like Hiroshima, Nagasaki - with the mushroom effect. Their neighbour's wife was in tears and so was Mrs. V. The neighbour said, "It's the end of the world. This is what we've read about".

Mr. and Mrs. V. went to bed and did not hear about the chlorine gas until 8:00 A.M. on Sunday morning. They were not worried because the wind was blowing away from their house. Later that day, they were told to evacuate.

They made no preparations and took no clothes. They did not even take their jackets. They were standing outside when the police came by marking "E" (for evacuated) in yellow crayon on the driveways. The policeman said "Okay, out!" and that frightened Mrs. V. She grabbed her pet bird and they just went.

Mr. V. was used to the blitz in the Second World War and had no fears. He feels that everyone, including the authorities, over-reacted. If the police had not seen them outside and told them to go, he would have tried to remain at home. Mrs. V. says that if so, he would have stayed alone because she would have left anyway - but then, she admits that she is a panic person. In any case, they expected to be away for only a couple of hours.

Continued. . .

*For some time after the evacuation, Mrs. V. could not sleep until after she had heard the midnight train going safely by. They always used to watch the trains from their backyard and to joke about a new automobile falling into the yard from the train. Now they look for chlorine and propane cars and count the numbers of them in the trains. Before the derailment, they did not really notice how many trains there were. Now they hear every one.*

services to involve official interpreters or local interpretative resources in an emergency. If interpreters were needed, they would normally have to be contacted at home. During an evacuation, therefore, interpreters living within the evacuated area could not be contacted. An emergency situation can easily be envisaged in which an area, which includes many non-English speaking households, is evacuated at a time (weekdays) when husbands and children (the usual interpreters) are away from home. Problems of comprehension for non-English speaking mothers and wives left alone in the house might lead to a demand for interpreters. There is a listing of the language capacities of each provincial Ministry that can be used in an emergency (prepared by the Citizen Development Branch of Culture and Recreation) but no plan is known to supply interpretive services in an emergency. In a similar situation, local interpreters might well be evacuated and not available at their usual telephone numbers. An emergency plan might, therefore, consider whether in future an emergency telephone should be set up for relaying information in different languages to non-English speakers, especially where there are sizeable ethnic populations. Local ethnic and community organisations might clearly play a role here.

#### 6.8. PEOPLE LIVING NEAR THE ACCIDENT SITE

For families living close to the CP Rail tracks near Mavis Road, the emergency presented several aspects that did not affect the majority of evacuees who lived farther away. The fire and explosions were much closer and more threatening; many of the homes were physically damaged; the smell of gases was widely experienced. They were the first to be evacuated, and left at night without yet knowing that chlorine gas was involved. Today, the source of danger, the trains, can still be heard as a reminder of the emergency.

The families who live close to the site do not differ significantly from other evacuees in their socio-economic status



or age although fewer of them own their own homes.

Despite the more dramatic nature of the emergency for them, they do not appear to have suffered significantly greater social or health impacts. At the time of the accident, more of them report that their families were scared and about a third of them were anxious on returning home. Some people had trouble sleeping for a while after their return, but a year later no one reported that it was still a problem. At least two children are known to have become afraid of trains.

People are more aware now of the hazards of dangerous goods passing on the railway tracks and are more concerned about them, but no one reported being very anxious or upset. Several people thought that transportation by truck was more dangerous. In short, the impact of the accident on the health and attitudes of those living near to the railway tracks differs little from that on the evacuees as a whole.

What did differ is the amount of physical damage to their homes. About half of the households interviewed on Eaglemount Crescent, Strabane Drive, Westlock Road, Consort Crescent, Forestwood Drive, and McBride Avenue (Figure 2.2), reported minor damage. This included cracks in foundations, broken windows, lights and TV antennae, paint scorching inside the house and a blistered roof. One car standing in the road had its paint finish burned. CP Rail officers inspected the homes to make an inventory of damage in case future claims were made against them. However, many householders believed that the inspection was to do with compensation, and they complained that they had not heard anything. In any case, these householders have not received any compensation so far for the damage to their homes either from CP Rail or from their own house insurance companies. Some people who applied for compensation to their insurance companies were refused. Only one householder reported receiving compensation from his insurance company for his car. The uncertainty about compensation is causing frustration among these householders.

Living close to the site.....

For Mr. and Mrs. P., the explosion was the second one they had experienced in four days. The Wednesday before, their neighbour's house furnace had exploded and they had been evacuated. Now, hearing the first explosion on Saturday night, they thought that their own house had gone. Lying in bed, they were terrified. Five minutes later, when the second explosion occurred just past midnight, Mr. P. was outside checking the house. Things began to fall on him and there was a tremendous heat. He ran into the garage. The flames began to calm down.

For a while, they did not know what to do. They were afraid for their two children ages 1 and 10. The baby was already disturbed from the previous explosion and night-time evacuation. The parents sat up listening to the radio until 2:30 A.M. Then the police came round at about 3:00 A.M. and told them to leave immediately. This added to their fear although they still did not know about the poison gas. Mr. P. remembered that his parents had been evacuated and had never been allowed back. Could it happen to him, he wondered? Nonetheless, they thought they would be back around 6 o'clock so they didn't take any clothes. By then, they didn't have time, anyway.

By Thursday, they were desperate for clothes, especially for the baby, and Mr. P. managed to persuade the police to let him back into his house to collect them. He was escorted to the door by the police and allowed five minutes to gather what he could. He found that his goldfish had died but that the house was alright. By this time, Mr. P. was not worried about the danger.

When they returned on Friday, 16 November, after the evacuation had ended, Mrs. P. and the children were still frightened. The 10 year old girl wanted to sleep with her parents and the baby took two weeks to get back into her usual routine. For Mrs. P., it took three months before she could really relax in her home. Even now, she is still afraid that it can happen again and she is reminded of the accident every time she sees the tank cars passing.

Mr. P. claimed for compensation for mental suffering and disruption as well as for his additional expenses and lost income but he didn't get it. The explosion caused cracks in his basement but he has received no compensation from CP Rail or his own insurance company.

They are moving house now but not really because of the accident. Mr. P. is more worried about planes coming over to Malton Airport than about the railway tracks. However, all things considered, Mrs. P. won't be too sorry to leave.

Living just north of Burnhamthorpe.....the unofficial evacuees

Mr. and Mrs. R. and their two children, live only 2 miles from the accident site, in a new development just north of Burnhamthorpe Road.

After seeing the accident, the family retired to bed and on Sunday morning stayed tuned to the radio and television. They heard no mention of their area but were concerned about how close the accident was to them. Later on Sunday morning, they heard that the Square One shopping mall was to be evacuated. It was also outside of the official evacuation zone, and is actually farther away from the accident. Mrs. R. became frightened and couldn't understand why, if Square One needed to be evacuated, their home was safe.

The family left immediately to stay with Mr. R.'s mother. They thought they would just be gone for the day and took nothing. His sister and family also arrived and the place became crowded. Both families stayed with their parents for the day (Sunday). By evening, Mr. and Mrs. R. realized that their area was still outside the official evacuation zone and decided to return home.

They tried to drive home but were stopped by the Ontario Provincial Police at Eglinton and Cawthra. An argument followed and Mr. R. tried to convince the police that his area was not evacuated. He failed, and the family moved on to Mrs. R.'s brother's home in Etobicoke Creek. They felt uncomfortable without a change of clothes or even a toothbrush between them. They were concerned about imposing on their relatives and treated them to dinner.

On Monday, they heard on TV that their home was definitely not in the evacuation zone and they made another unsuccessful attempt to return home, and had to return to their relatives. They finally managed to get home on Tuesday and aired the house straightaway.

Although they spent over \$200 extra during their stay away, they knew that they could not get any compensation because they were not officially evacuated. Mrs. R. feels indignant about the inequity of the compensation process, and about the lack of attention they received during the crisis. No one explained satisfactorily why Square One should be evacuated and their area should not. They didn't feel that they should put their lives in the hands of the weatherman.

"It was frustrating, it really was, because I felt we were so much closer than anyone else, regardless of wind."

It was the ambiguity in their situation that they found so difficult. As Mrs. R. said, "We were and we weren't....we felt forgotten". Mr. R. observed, "It's almost as though there was a magic barrier there (at the Burnhamthorpe evacuation boundary); that nothing could happen to the north but everything could happen to the south".



Despite the accident and the publicity it gave to the risks of living near railway tracks, few of the householders near the accident site have considered moving. A local real estate agent believes that the number of house sales and market values have not been affected by the accident although a few buyers specifically do not want to buy homes near the tracks. Most householders report similar conclusions although there are certainly rumours about people trying to move out because of the accident. They appear to be no more than rumours.

#### 6.9.. PEOPLE LIVING ON PERIMETER OF EVACUATION ZONE

The delimitation of an evacuation zone produces a sharp boundary. On one side, everyone is asked to evacuate because of the danger. On the other, people are told that it is safe for them to remain. When this boundary runs down the centre of the road, leaving neighbours across the street from each other in different categories, confusion and some disbelief is almost bound to occur.

In the Mississauga emergency, many people found themselves on the perimeter of the evacuation as the zones were moved progressively outwards. They were, in effect, put on alert that they might have to evacuate soon, and were subsequently asked to leave their homes. Some people, including residents of one nursing home, remained on the perimeter and were never officially evacuated.

Those people living just outside the evacuation zone in Etobicoke and Oakville felt relatively uninvolved in the crisis. They lived far from the accident site and felt that they were in no real danger. The social impacts on these people were minimal except where they took evacuees into their home. Relatively few of them voluntarily evacuated.

Another group of people on the perimeter were much more involved in the emergency. They lived just north of

Burnhamthorpe Road which represented the northern boundary of the evacuation zone throughout the crisis. Many live in recently developed residential areas which are not yet on some road maps. Since the accident, many more houses have been built there. One group of people were among the closest residents to the accident site: they were within 3 kms. (Figure A1).

The social impacts on these people are in some ways greater than on those of the evacuees in general. They include:

- (a) fear and anxiety about the accident and being close to it;
- (b) uncertainty about whether they should evacuate, or wait to be officially evacuated, or even whether officials were aware of their existence;
- (c) frustration about not being allowed back into their homes by the police even when they showed proof of address outside the evacuation zone;
- (d) confusion about the decision to evacuate Square One Shopping Centre which is also north of Burnhamthorpe Road and outside of the evacuation zone. Some people took the order to evacuate Square One as an order for their area and left believing that they were officially evacuated;
- (e) inequity felt about the compensation offered by CP Rail only to those south of Burnhamthorpe, given the fact that some were refused access to their homes because of the evacuation, even if they simply left for work as normal and tried to return. They had additional expenses through no fault of their own and yet had no access to compensation.

The anxiety felt by people living north of Burnhamthorpe is demonstrated by the fact that 60% of the families voluntarily evacuated their whole household. In another 4% of households, some members of the family left (see Section 5.8).

Table 6.3 shows that most of them left because they were anxious about the possible effects on them of the accident, particularly the effects of the chlorine gas. They left on Sunday and expected to be back for the night. Most took nothing

with them for a night away so that they experienced considerable inconvenience. For some, this inconvenience was preferable to the uncertainty of not knowing when they might have to evacuate.

Table 6.3. Reasons for voluntary evacuation given by people outside evacuation area

	%
Worried in case of danger	34
Believed they were advised to go	14
Because near evacuation zone	11
Saw others go	9
Concern about pregnancy/children	8
Concern about health	6
Other reasons	18
(N = 126)	100%

Confusion about where the boundaries were located was a problem for some people. Fourteen percent believed that they had been advised to leave. Many of these people became confused when Square One Shopping Centre was evacuated, and they left their homes immediately. These same people became angry when they tried to go home along Burnhamthorpe Road and were refused entry at the police barricades. Most families were not allowed through even though they showed proof of residence outside the evacuation zone. A few families did manage to pass the barricades. Clearly, individual police officers made different decisions about whether to allow people living north of the evacuation zone to pass along Burnhamthorpe Road to reach home. There were also problems in communication between the officers on the perimeter and their commanders because the public often had information on boundary changes before the police officers did on the perimeter<sup>1</sup>.

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<sup>1</sup> *This problem has been since identified and rectified in revised emergency plans by Peel Regional Police.*

Afterwards, people north of Burnhamthorpe Road found they were not eligible for compensation. Thirty-five percent of these people tried to claim from CP Rail for out-of-pocket expenses. The claims ranged from \$35 to \$600 with most falling between \$100 and \$200. About a quarter of those who made claims report that they received amounts ranging from \$100 to \$300. Others were refused on the grounds that they were not evacuated. It appears that those people who received compensation from CP Rail got their claims in early before CP Rail realised which streets or numbers in streets were not officially evacuated.

Many of the families living on the perimeter feel that several aspects of this situation are inequitable: the inconvenience and, in some cases, enforced absence from their homes, followed by the loss of compensation for out-of-pocket expenses (except for a lucky few).

Not all the families on the perimeter decided to leave their homes, even those close to the accident site. Those that remained were not very concerned that they were not officially evacuated. They felt that if there had been any real danger to them, they would have been asked to leave. They viewed the media coverage as thorough, claiming that the definition of boundaries was clear. Like those who evacuated, these people had some problems returning to their homes if they had left their areas for any reason. All were stopped and confronted by police who usually let them go through to their homes upon proof of address. Some re-entered from the north, finding "round-about" routes home.

Those who did not evacuate from the perimeter areas took on additional responsibilities. Most knew others who left (including neighbours who, like themselves, were not officially evacuated.) They found themselves suddenly responsible for the homes and property of those perimeter neighbours who left. Some made daily rounds feeding pets and watering plants. They commented on the look of the eerie empty streets. Others housed evacuees who were pleased to stay and take shelter in the perimeter area.



People living on the evacuation zone boundaries in Oakville and Etobicoke were far from the accident itself. Relatively few of them left their homes but the emergency still affected them. Some were frightened about the danger from the chlorine gas. These were a minority. More were made anxious by the uncertainty of not knowing when and if they would be the next ones to have to move. It made the conduct of their daily lives more difficult.

Those people far away who were worried about the danger, tended to either have family members or friends who were evacuated, thus making them more aware of the crisis, or a family member or friend who was particularly concerned about them and who encouraged them to leave or be prepared to leave. These people, of which there were very few, had particular reasons for worry; for example, a mother with small children, a woman with an elderly parent, and a senior citizen who preferred to leave at her leisure rather than taking the chance of being rushed out suddenly.

People living on the perimeter had some thoughts and experiences in common. They kept in close touch with the news to try to understand their particular positions and instructions and to learn of any changes in the crisis and evacuation. They seemed to agree that police did an excellent job in minimizing looting and that, in general, the emergency was handled well. Many commented, however, that they only fully understood the accident and emergency procedures after it was all over and various television specials were presented. It was felt that the position of people on the perimeter should have been made much clearer. One man observed:

*"It's almost as though - Burnhamthorpe - there was a magic barrier there, that nothing could happen to the north, but everything could happen to the south."*

The perimeter people did not want more attention; they wanted special advice, particularly an explanation of their position - close, but upwind of the accident - in relation to the risks.

In the Mississauga emergency, the decision to evacuate certain areas was made on the basis of distance from the site and direction in relation to wind. This meant that some streets which are located close to the accident and were upwind of the site at the time, were not evacuated. The Command Post decision clearly did not convince half of the residents of those areas, who evacuated themselves. Many of these residents felt that wind could shift at any moment, and that they did not want to wait around until it did.

Farther away from the accident, fewer people left their homes but were made anxious by seeing neighbours evacuate and by wondering whether they would be next.

The Mississauga emergency has shown that in an evacuation of a residential area, it can be expected that:

- (a) some people outside the evacuation zone will voluntarily evacuate;
- (b) where people who live close to an airborne hazard are not evacuated for some reason (such as wind direction) more than 50% may leave their homes on the basis of their own risk assessments;
- (c) people living on the perimeter of an evacuation zone, whether near or far from the emergency, are anxious and in need of information directed specifically to them. This may be advice to be prepared to move or an explanation of why they are just beyond the boundary.

## 6.10. PEOPLE IN EVACUATION CENTRES

### 6.10.1. The range of the Evacuation Centre experience.

For most Mississaugans, the evacuation meant a visit to friends and relatives, or a stay in a hotel. For some 8,700 people (3.8%), it meant between one and seven nights camping in an Emergency Evacuation Centre. As had been discussed in the preceding chapter, many of the people who went to the Centres were among the least able to afford to pay for a hotel out of their own pockets, and did not realise at the time that they would be able to claim compensation.

As individuals, they had very different reasons for choosing to go to a Centre rather than to a private home (Section 5.5 ) and they were in a variety of family situations. Some were old; some were families with young children, some were pet owners, some could not speak English. Thus, as a group, the evacuation centre people cut across all the other categories of people discussed in this chapter. This makes it difficult to separate out the social impacts of the Evacuation Centre experience from the effects related to their family situations.

The analysis is further confounded by the fact that the different Evacuation Centres provided very different experiences for evacuees. They varied in size, degree of crowding, quality of facilities, services and general organisations. They also varied through time; for example, the International Centre was crowded, cold and had insufficient food and beds for the first night it was opened. Evacuees were even charged for cups of coffee. Later in the week, there was abundant free food and plenty of space for the few people left. Most Centres had many dogs and cats mixed in with people while one refused to accept pets (Section 4.3).

Thirty-eight percent of evacuees registering at the Centres stayed less than 24 hours. Some were clearly dismayed

by the accommodation they were offered, particularly in the Centres like Square One and the International Centre, and they decided to stay with friends and relatives or go to to a hotel. These people were among the more affluent evacuees registering at the Centres (Section 5.5.1).

#### 6.10.2. Satisfaction with the Centres

The survey of evacuees registered at Centres asked them to evaluate their food, sleeping, washroom, recreation, health care and information facilities (Table 6.4). Overall, evacuees were most satisfied with the food and health care provided, although older people (over 60 years) were significantly less happy with them. The Centres themselves did not score very differently for food and health care except for the health care provided at Square One, which was ranked below that in other Centres.

Washroom facilities at the International Centre (where there were no showers) were the most often evaluated as inadequate. In all evacuation centres, people in their 20's and 30's were least satisfied with washroom facilities. Younger people (in their 20's) were also the most critical of the recreation facilities offered by the Centres, particularly in Square One. The greatest dissatisfaction expressed by all evacuees in the Centres was with sleeping accommodation, especially in the International Centre where some 70% of evacuees felt the accommodation was inadequate.

Follow-up interviews with evacuees reveal that sleeping in some Centres was extremely difficult. Initially, people did not always have beds or even places to sit. They were crowded together so that a stranger might wake up to find an inadvertent arm around him. Other people never went to sleep because of the unaccustomed lack of privacy. In some Centres, the noise made sleep impossible with children, pets

Table 6.4. Evacuees' evaluations of facilities provided  
at selected Evacuation Centres

	<u>Percentage at centres saying facilities were INADEQUATE</u>				
	<u>International</u>	<u>Square</u>	<u>Erindale</u>	<u>Streetsville</u>	<u>All</u>
	<u>Centre</u>	<u>One</u>	<u>SS</u>	<u>SS</u>	<u>Centres</u>
	%	%	%	%	%
Food	9	18	11	15	12
Sleeping	74	69	50	50	62
Washroom	30	15	18	23	20
Recreation	50	73	14	68	52
Health Care	13	27	7	8	15
Information	15	41	19	46	27
Overall operation	3	9	0	8	5

and radios all contributing.

At the same time, other centres were praised for providing separate quiet rooms for sleeping. Generally teenagers, especially enjoyed the communal atmosphere.

#### 6.10.3. Comparison of the evacuation experience; private home versus Evacuation Centre

Compared to the majority of evacuees who went to private homes, the Evacuation Centres clearly provided a different short-term experience of the emergency. It was an experience that seems to have suited young people best with unlimited access to fast food like hamburgers; organised films and games; and plenty of companionship. For older people, the noise, lack of privacy, boredom during the day and difficulty in sleeping during the night, stand out in their memories.

On the other hand, many people in private homes felt stress through crowding and the fear of imposing on others. For mothers of young children, and owners of pets, the stress was focussed on the potential damage their charges could wreak. For families with a disabled or infirm member, stress was related to concern about what impact the move and the strange surroundings might have upon their relative's condition.

It seems, however, that the experience was a more exhausting one for people in the Centres. They emerged tired, more dishevelled and more in need of a good bath and rest than did other evacuees. Many more of them would not wish to repeat the experience; 25% say they would go to a hotel next time rather than return to an Evacuation Centre (this compares to only 8% for all evacuees).

The length of time people stayed in the Centres is related to their satisfaction with the facilities and to their response to the evacuation generally. Those people staying 3 days or more are more satisfied with the Centres than those who left after one day. This is both because the most



Housing evacuees.....

Mrs. L. heard on the radio that people in the Evacuation Centres needed food and shelter. She is the secretary-treasurer of a church group that tries to help the poor and needy and her immediate reaction was to take sandwiches and coffee to her nearest Centre.

At the Centre, the Red Cross gave Mrs. L. the names of two women who needed accommodation. They were Mrs. A., a lady in her 70's and her daughter, Miss A., who was in her 40's. They also had their dog with them, a huge German Shepherd. Mrs. L. assured the ladies that all three would be welcome in her home.

The three evacuees stayed for a week with Mrs. L., her husband, and their two grown-up children. Mrs. L.'s daughter gave up her downstairs bedroom for the two ladies and slept on the sofa bed in the study. Mrs. A. is somewhat crippled from an old leg injury and has difficulty walking.

Everyone got on well together. Mrs. A. was always helping with the dusting and peeling potatoes. It was just like having Mrs. L.'s own mother there. The dog was well behaved and much appreciated by both families. In the evenings, the group watched T.V. or enjoyed the fellowship of other friends. Mrs. A. particularly enjoyed listening to Mrs. L.'s son playing the piano.

They have kept up the friendship through visits and phone calls since the evacuation. The evacuees sent Mrs. L. a big, beautiful flower arrangement and Miss A. has sent presents she made herself. In return, Mrs. L.'s son has sent a tape of himself playing the piano to the elderly lady to remind her of the time they all spent together. Miss A. tells Mrs. L. that the stay with them during the evacuation was the happiest time her mother had had in years.



dissatisfied are most likely to get up and leave, and because the facilities themselves improved as they became better organised and the numbers of people to be served went down.

The people who stayed longer in the Centres were the most likely to respond in our surveys that the evacuation was justified because of the danger that existed and to comment that the authorities acted well. They appear, in retrospect, to have been among those who were most satisfied with the way the evacuation was handled. At the time, however, people in charge of the Centres saw an increase in restlessness among evacuees after the first three days. Evacuees quickly tired of fast-food and wanted to go home. They became more impatient with everyone and clearly more bored with their situation and the repetitiveness of the news stories recapitulating the week's events. A change in their diet and situation would have been called for if the evacuation had lasted any longer.

#### 6.10.4. Impacts felt after the return home

The social impacts of the emergency appear to be most related to a person's family circumstance and responsibilities, and to a lesser extent how close to the accident they lived, rather than to where they spent the week of the evacuation. The people spending that time in Evacuation Centres do not appear to have suffered significantly greater, or different, effects from other evacuees. They report similar degrees of concern today about the rail transportation of hazardous goods as do other evacuees (Table 6.5) although they were more anxious about their family's safety during the emergency. (Table 6.6.)

Table 6.5. Concern today expressed by all evacuees and those using centres about the rail transportation of hazardous goods.

	<u>Very Concerned</u> %	<u>Concerned</u> %	<u>Not Concerned</u> %	
All evacuees (N=504)	45	40	15	100%
Those in centres (N=175)	45	36	19	100%

Table 6.6. Concern felt by all evacuees and those in Centres during the emergency

	<u>Very Concerned</u> %	<u>Concerned</u> %	<u>Not Concerned</u> %
All evacuees (N=504)	31	33	36
Those in Centres (N=175)	42	29	29

Table 6.7. Knowledge of transportation of hazardous materials by rail before the accident for all evacuees and for those in Centres.

	<u>Knew Before</u> %	<u>Did not know before</u> %
All evacuees (N=504)	34	66
Those in Centres (N=175)	20	80

Their concern today is a new one for most of them because 80% of the Evacuation Centre evacuees were unaware of the risk before the accident (Table 6.7). This greater proportion of people in evacuation centres not knowing about the risk is related to the higher proportion of low wage earners among them; fewer of those with low family incomes or blue-collar occupations knew about the risks beforehand.

The Evacuation Centre group do report suffering some long-term effects more frequently than do other evacuees. Only 31% say they have suffered no long term consequences (compared to 38% for all evacuees) and 20% mention specifically that they feel there are permanent effects on themselves and their families (compared to 13% for all evacuees). In addition, 25% say that next time they are asked to evacuate, they would not use an Evacuation Centre, implying that it was not an experience that they would wish to repeat.

#### 6.11. CARE OF PETS

Half the homes in Mississauga had at least one pet at the time of the evacuation. The removal of 75,500 families from their homes therefore also affected some 38,500 animals. Of these, 16,500 were dogs, 11,200 were cats and the remainder included fish, rodents, birds and reptiles (Table 6.8).

Most dog owners (88%) took their pet with them when they evacuated but only half (55%) of the cats were taken. Fish, rodents and birds were generally left behind. This meant that an estimated 2,000 dogs, 5,000 cats and 8,000 fish, rodents and birds were left in the evacuated area. While many pets were left with sufficient food and water for one day, their owners began to get anxious by Tuesday morning and hundreds phoned the Ontario Humane Society for help.

By 16:00, on Tuesday 13 November, an Emergency Animal Care Program was set up by the Ontario Humane Society in cooperation with the Police and the City of Mississauga

Animal Control Department for animals left inside the evacuated area. Owners were asked to bring house keys to the OHS Emergency Headquarters at Mississauga City Hall or to an Ontario Humane Society office and to provide written (if possible) or verbal permission for an OHS Officer to enter their premises. The service was advertised on the media and some 1,861 homes, stores and other premises were entered and 2,500 animals were cared for.

In addition, there were kennels, pet shops, animal research laboratories and a bird sanctuary in the evacuation zone. Some owners decided to remain with their animals inside the zone. A veterinary hospital close to the accident was evacuated. Research animals at the University of Toronto and in various schools were fed by students or regular maintenance personnel under police escort. People with pets in evacuation centres who were going to hotels handed them over to OHS officers to be taken to private boarding kennels in Oakville.

The police granted permission for Ontario Humane Society officers to enter the evacuation zone only in marked, official OHS vehicles and with a police officer accompanying each vehicle as a witness to the entry to private premises. This obviously increased the demands on police officers' time and made the policing of the evacuated area (for looters, etc.) more difficult.

The demands on the Ontario Humane Society officers and volunteers were also very high. They worked long hours dealing with anxious pet owners, necessary paper work, and hungry animals. The last calls to private homes to care for pets were made at 20:00 on Friday, the 16th, but for the next few days, they had to organise the return of thousands of house keys to their owners. Many owners had given their only available house key to the Humane Society.

Remarkably few animals were permanently lost because of the evacuation. A few animals died, mainly fish and birds left without sufficient care and unable to find food for themselves.



Table 6.8    Pet ownership in Mississauga at time of  
evacuation

(a) <u>Number of pets</u>	
	Households (N=352) %
No pets	48.9
1 pet	27.0
2 pets	11.6
3 pets	4.3
4 pets	0.9
5 pets	0.9
No answer	6.5
	<hr/> 100.1%
(b) <u>Type of pets</u>	
	Households (N=352) % *
No pets	48.9
Dog	26.1
Cat	17.6
Fish	6.3
Rodent	1.1
Bird	6.5
Hamster	2.3
Reptile	0.6
No answer	3.4

\* Percentage adds up to > 100 because some householders have more than one pet.

Some animals made a mess in the homes in which they were abandoned. According to the Ontario Humane Society, animals suffered from loneliness as much as from anything else. Financial compensation was given by CP Rail to some owners of fish and birds for the loss of their pets. In the longer term, there was no apparent change in the frequency of lost or abandoned animals or in the number of cases of animal abuse.

The Mississauga evacuation highlights the large number of pets living in a residential area and the anxiety that can be generated for householders when they are separated from their pets during an emergency. The problem of mass care of pets during an evacuation was minimised in this case because most of the 14,500 dogs and 6,000 cats evacuated were taken by their owners to the homes of friends and relatives. The pets which were taken to evacuation centres caused complaints from other evacuees and most hotels refused to take pets with evacuees.

An emergency in which a higher proportion of families were forced to use emergency evacuation centres or hotels is likely to produce many more pets needing centrally organised care.

## 6.12. . CHANGES IN PUBLIC RISK PERCEPTION

### 6.12.1. Prior knowledge about rail transportation risks

Before the accident, few people knew that hazardous materials were being regularly transported by rail through their neighbourhood (Table 6.9 ). In Mississauga, only one third of the evacuees said that they knew of the transportation before the accident. The figures are similar for the control group (27%). People living north of Burnhamthorpe were found to have even less awareness, but this is probably related to the fact that they generally are newcomers to the area. More evacuees using the Centres also report being unaware of the hazard.

Table 6.9 Knowledge of the transportation of hazardous materials by rail through their own neighbourhood before the accident

	<u>Had Knowledge</u>	<u>No Knowledge</u>	<u>No Answer</u>	
	%	%	%	
All evacuees (N=504)	34	66	0	100%
Evacuees in centres (N=175)	20	80	0	100%
People living on perimeter (N=200)	23	77	0	100%
Control group (Don Mills) (N=200)	27	73	0	100%

#### 6.12.2 Concern Today about Rail Transportation of Dangerous Goods

Since the accident, almost everyone in Mississauga and probably in Metro Toronto has become aware of the transportation of dangerous goods through the Metropolitan area. About 80% of all those questioned say that they are concerned about the risks.

The households who were evacuated are the most likely to say that they are "very concerned", followed by those living on the perimeter of the evacuated area. People living in the Don Mills Control Area at a similar distance away from the railway tracks are less likely to express great concern but nevertheless, may say that they have some concern (Table 6.10).

This concern about transportation risks in general is not related to a person's sex, age, nor whether one has children. It is more a function of their socio-economic position. In contrast, concern about the danger during the emergency shows a different pattern with women, especially those with children under 10 years old, showing the most concern whether or not they live close to the railway tracks or accident site (Section 6.2.6).

#### 6.12.3 Impact of the Accident on Public Perception of Risks

A major event, such as the Mississauga derailment, will clearly have impact on the public's awareness and concern for rail accidents. It may also affect how people view other hazards of a technological society.

To test this hypothesis, evacuees and the control group in Don Mills were asked to:

Table 6.10    Concern today about the transportation of  
hazardous goods by rail through their  
neighbourhood

	<u>Very Concerned</u> %	<u>Concerned</u> %	<u>Not Concerned</u> %	<u>No Answer</u> %	
All evacuees (N=504)	45	41	14	1	100%
Evacuees in centres (N=175)	44	35	19	2	100%
People living on perimeter (N=200)	35	39	24	2	100%
Control group (Don Mills) (N=200)	26	56	17	1	100%

- (a) identify what risks or hazards concerned them most  
(open question: no alternatives offered)
- (b) give reasons why they were concerned about them  
(open question)
- (c) compare the probabilities of another derailment; a road transportation accident involving dangerous chemicals; a plane crash involving many deaths; and a nuclear accident as serious as Three Mile Island occurring in Southern Ontario in the next 10 years.

Table 6.11 shows the risks of most concern to the evacuees; to those evacuees using the official shelters, and to the control group. The most frequently mentioned risk for both groups of evacuees is a train wreck, followed by a nuclear accident, chemical accident and road accident (in that order). For the control group, the risk of a nuclear accident is of concern to more people, followed by a road accident. Concern about a train accident is third, with 10% of the people interviewed spontaneously mentioning it. Differences in risks mentioned are not significant between the two groups of evacuees, but they are highly significant (Chi-square significant at less than .001 confidence level) between evacuees and non-evacuees. It therefore seems that the experience of the evacuation has focussed the evacuees attention, in particular, on transportation accidents, especially rail accidents. As a consequence, nuclear and air and water pollutions risks are of relatively less concern.

Not all risks are of concern to the public for the same reasons. Some, such as nuclear accidents, are feared because their effects are seen as long term, or large scale. Others are of concern because they present a hazard to the public at large (fires, road, rail, and air accidents). Transportation risks are seen as having high probabilities and caused by human error. In contrast, air and water pollution are felt to result mainly from inadequate safety measures (Table 6.12).



Table 6.11 Risks of most concern to public

<u>Risks</u>	<u>All evacuees (N=504)</u>	<u>Those using Evacuation Centres (N=175)</u>	<u>Control Group (Don Mills) (N=200)%</u>
	%	%	%
Train wreck	19	24	10
Road accident	10	10	16
Plane crash	6	9	6
Nuclear accident	12	17	18
Chemical accident	11	8	3
Fire	2	3	4
Air pollution	5	5	4
Water pollution	2	0	2
Other risks	19	7	18
Don't know	14	16	19
	<hr/>	<hr/>	<hr/>
	100	99	100

Differences amongst the three groups are significant at .001 confidence level.  
 Chi-square = 412.976 with 14. d f.

Table 6.12 Reasons why different risks are of concern to evacuees (main sample: N = 504)

	Safety precautions inadequate (%)	Is danger to public (%)	Effects are term long (%)	Effects are large scale (%)	Beyond human control (%)	People are careless (%)	Has high probability (%)	I have experience of it (%)
Road accident	8	20	2	3	8	22	36	100%
Fire	6	47	0	6	18	6	6	101%
Nuclear accident	6	5	28	41	13	2	4	99%
Chemical accident	15	16	14	26	14	2	9	99%
Train wreck	24	22	3	17	7	12	14	101%
Plane crash	8	48	0	13	10	6	15	100%
Water pollution	20	7	6	40	7	6	7	100%
Air pollution	16	9	12	42	5	5	9	100%
Other risks	15	15	6	27	14	6	14	100%

Although the frequency with which the risks themselves are mentioned varies between evacuees and non-evacuees, the reasons why the risks worry the public are not affected by the evacuation experience.

However, the emergency has influenced the evacuees' perception of the probabilities of future major accidents. Table 6.13 shows the evacuees' and control group's perception of the likelihood of four different risks occurring in Southern Ontario in the next 10 years. The differences between Evacuation Centre users and other not significant, but in each case there are highly significant (at .0001 confidence level) differences between the evacuees as a whole and the control group.

Of the four types of major accident (rail, road, air and nuclear) more people in all groups see the road accident as most likely; followed by plane, derailment and nuclear accidents (in that order). For each risk considered separately, evacuees believe that it is more likely to happen than do other people living outside Mississauga.

The impact of the emergency and the evacuation experience appears, therefore, to have changed the way the public perceives risks - not only the risk of derailments but also of other man-made hazards. There is evidence that a major accident event affects a person's whole framework for risk perception so that some risks become magnified while others are downplayed. In this case, the derailment has made the evacuees sensitive to transportation risks in general. It also seems to have increased their perception of the probability of an accident in a nuclear reactor, while slightly reducing their attention overall to nuclear risks. The derailment has, for a time at least a year afterwards, focussed public awareness on "accidents" rather than the cumulative risks from air and water pollution.

Table 6.13 Perceptions of risks of another derailment, road accident, plane crash, and nuclear reactor accident occurring in Southern Ontario within the next ten years.

(a) another serious derailment

	<u>Very Likely</u> %	<u>Likely</u> %	<u>Unlikely</u> %	<u>Very Unlikely</u> %	<u>Don't Know</u> %	<u>Total*</u> %
All evacuees	29	45	17	6	3	99
Those in evacuation centres	24	41	25	8	2	100
Control group	14	51	18	15	2	100

(b) road accident involving dangerous release of hazardous chemicals

All evacuees	45	47	5	1	3	101
Those in evacuation centres	40	48	6	3	3	101
Control group	35	47	11	3	4	100

(c) plane crashing involving many deaths

All evacuees	30	46	18	3	3	100
Those in evacuation centres	27	49	15	6	4	101
Control group	21	47	24	5	2	99

(d) nuclear reactor accident as serious as Three Mile Island

All evacuees	12	30	35	19	4	100
Those in evacuation centres	13	30	33	18	6	100
Control group	6	34	35	15	9	99

\* Percentages add up to >100 due to rounding errors.

## **Chapter 7**

# **ECONOMIC COSTS OF THE EVACUATION**





## 7.1 INTRODUCTION

At the most general level the economic costs of the Mississauga evacuation consist of the value of the lost opportunities for production and consumption resulting from the evacuation. Production losses consist of the reductions in output of business and the public sector that are not made up later. Increased expenditures on food, accommodation, and travel are examples of consumption losses; resources used in these ways are not available for other purposes. A less obvious though equally important form of lost consumption opportunities is the foregone use of houses, apartments, and other buildings, such as schools and libraries that were evacuated. Mortgage payments and rents were not affected by the evacuation but the value of a building lies in the value of the services it provides. An interruption to the provision of these services because of the evacuation represents an irretrievable loss of opportunities for consumption that is just as real as the losses incurred from spoiled food.

These few examples illustrate how the costs of the evacuation may be defined. Closely related to the problems of definition are those of estimation. The main difficulty in estimating the costs lies in the fact that not all costs show up as monetary payments, as in the case of lost housing services, and some monetary payments do not correspond to foregone opportunities, as when an expense would have been incurred anyway.

A further problem that bears on the definition and estimation of the evacuation costs stems from the question of geographical coverage. For the household sector, additional expenses were incurred not only by those households that were evacuated, but also by those outside the evacuation zone which provided accommodation to evacuated friends and relatives.

A more problematic issue relating to business sector costs is to the extent to which losses from companies inside the evacuation zone were matched by gains to other companies located

outside the zone. In these cases, costs to Mississauga cannot be counted as costs to the province as a whole, since they do not correspond to an overall reduction in production or consumption. Such transfers could have important distributional implications and could provide just cause for compensation, but they are qualitatively distinct from business losses due to perished stock and other wasted resources.

Table 7.1 provides an overview of the range of economic impacts of the Mississauga evacuation. Two zones are distinguished: the evacuation zone and the area outside of the evacuation zone. Each of these zones contains a set of resources consisting of: buildings, infrastructure (roads, water and electricity supply, etc.), durable goods, non-durable goods and labour. Labour is defined here as the typical daily work force available in either zone rather than the portion of the total work force that happens to reside in each zone. The entries in Table 7.1 give examples of the types of impacts that should be considered in an overall assessment of the costs involved.

Owing to the limited resources available to the study team, the assessment of the economic costs of the evacuation described in this chapter is not fully comprehensive. The study does not consider costs born by C.P. Rail or Dow Chemical but only those imposed on others by the accident. For the household sector, only costs borne by households inside the evacuation zone are estimated. These estimates are based on responses to the public surveys conducted by the project (Appendix 1). Costs to Mississauga's business community, that is, the private sector, were looked at in total but the emphasis is still placed on that portion of the private sector which was closed down due to the evacuation. With respect to the public sector, the costs incurred by the various government departments and emergency services provide the main focus of attention. The costs to voluntary associations were not estimated.

Table 7.1

## AN OVERVIEW OF THE ECONOMIC IMPACTS OF THE EVACUATION

RESOURCES	HOUSEHOLDS	BUSINESS SECTOR	PUBLIC SECTOR
<u>In Evacuation Zone</u>			
- Buildings	Housing, schools, libraries, hospitals etc. unavailable	Factories and shops closed	Offices closed
- Infrastructure	Transportation impeded	Transportation impeded	Transportation impeded
- Durable Goods	Cars, household equipment unavailable	Cars, trucks & equipment unavailable	Cars, trucks & equipment unavailable
- Non-Durable Goods	Food perished, pets died	Food perished	Food perished
- Labour	Employment reduced	Employment reduced	Some employment reduced, other increased (police, fire, ambulance)
<u>Outside Evacuation Zone</u>			
- Buildings	Housing provided by friends, realations, hotels, & evacuation centres	Some closures, more intensive use in other cases	Increased use of some buildings
- Infrastructure	Transportation impeded	Transportation impeded	Transportation impeded
- Durable Goods	Cars borrowed & rented	Idle capacity, equipment rented	Idle capacity, equipment rented
- Non-Durable Goods	Additional food & travel expenses	Some increases & some decreases in materials used	Increased supplies for emergency services
- Labour	Some increases and some decreases in employment	Some increases & some decreases in employment	Increased employment for those providing emergency services

In addition to these restrictions on the scope of the cost estimates, it is emphasized that the accuracy of the estimates of the components of costs that were included varies according to the availability of reliable data. Whereas a detailed questionnaire was used to obtain information on household costs, the estimates of business sector costs were based on rather rough calculations using national and provincial statistics. Public sector cost estimates were derived directly from government agencies. It was simply not possible to utilize a perfectly consistent set of accounting procedures across agencies within the public sector. By the same token, the comparability of the cost estimates among the sectors is limited.

7-2 HOUSEHOLD SECTOR COSTS

The household sector costs for which estimates are presented include:

- a) additional food expenses;
- b) additional accommodation expenses;
- c) additional travel expenses.

Two periods are distinguished:

- a) the evacuation period
- b) the 5 days after the return home.

Estimates are also provided of the income lost by households in the evacuation zone.

In addition to these costs, estimates are presented of the sums of money that households say would have fully compensated them for the evacuation. These amounts are compared with the reported out-of-pocket expenses and income losses, and also with the compensation claimed and received from Canadian Pacific Rail.

The information on household costs was obtained from responses to a detailed questionnaire (see Appendix 1). One may be concerned that such responses may be biased. For instance, if people feel that they were harmed unjustly by the evacuation then they may overstate their dollar costs. On the other hand, since the questionnaire was administered many months after the evacuation people may have overlooked some of the costs they did, in fact, incur. These considerations necessarily imply some degree of uncertainty in regard to the accuracy of the information supplied by the households, although we have no reason to believe that the resulting estimates are biased in one direction or the other.

### 7.2.1 Estimated Additional Costs Borne by Households Going to Private Homes and Hotels

Table 7.2 shows that the vast majority of households evacuating to private homes and hotels reported some increase in costs and for 75% of the households the increase in total costs was \$40 or more. The average increase in costs per household was reported at almost \$200.

Respondents to the questionnaire<sup>1</sup> were also asked to estimate the additional costs that they incurred according to specific categories: accommodation, food, travel, and other. Table 7.2 shows that 70% of the households in the evacuation zone incurred no additional costs for accommodation, whereas this was true for only 30% of the households in the case of food. Additional food costs accounted for more than one-third of all the additional costs on average per household. By adding the estimated average additional cost per household for each of the categories, a total additional cost can be estimated. This is shown in Table 7.2 to be somewhat less than the total costs reported by the respondents. The discrepancy is due to the fact that some households only reported a total additional cost and did not provide any information on the breakdown.

According to the Mississauga Planning Office there were 75,500 households in the evacuation zone in November 1979. Of these about 5% or 3,775 went to evacuation centres and are dealt with as a separate sample. It is possible to estimate the total costs to the households in the evacuation zone, excluding those that went to evacuation centres, by multiplying the average cost per household, given in column 3 of Table 7.2, by 71,725. The results are given in column 4 where it is shown that the total

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<sup>1</sup> Respondents who did not answer questions about costs were dropped from the sample for the purposes of this analysis.



Table 7.2

ESTIMATED ADDITIONAL COSTS BORNE BY HOUSEHOLDS  
IN THE EVACUATION ZONE DURING THE EVACUATION PERIOD<sup>1</sup>

Cost Category	% of Households Reporting \$0	% of Households Reporting Less Than \$40	Average per Household (\$)	Estimated Total Cost for Evacuation Zone (\$ million)
- Accommodation	70	73	34.8	2.5
- Food	30	45	65.9	4.7
- Travel	37	83	20.3	1.5
- Other	40	61	55.1	4.0
Total (calculated)	-	-	176.1	12.6
Total (reported)	12	25	199.2	14.3

<sup>1</sup>For the 71,725 households that did not go to an evacuation centre.

calculated cost of the evacuation, during the evacuation period, was \$12.6 million. This compares with an estimated total reported cost of \$14.3 million.

In these calculations, respondents not answering a question were dropped from the sample. This would tend to overstate the estimated average and total costs if no answer really meant that zero costs were incurred. However, the maximum error that could be introduced by this means is 20%.

Figure 7.1 shows the distribution of extra costs broken down by category, and the total additional expenses reported. These are presented as cumulative distributions, which show the percentage of households reporting costs at or below any given level. Thus, Figure 7.1 shows that 30% of the households reported total additional expenses of \$50 or below, and 75% reported total additional expenses of approximately \$225 or below. The median total additional costs corresponds to the 50% cumulative frequency; thus, 50% of households reported total added costs of \$140 (the median) or less. A similar analysis can be done for any individual category of costs, using the cumulative frequency curves.

For a comparatively small number of households the additional costs were many times greater than the average costs for all households. This pattern is indicated by the sharp upward turn in all the cumulative frequency curves in the 90%-plus region in Figure 7.1.

#### 7.2.2 Estimated Additional Costs Borne by Households Evacuating to private homes and hotels during the Five days after returning home

Table 7.3 shows that the majority of households in the evacuation zone incurred no additional costs after returning home. This is true for each of the categories of costs and for the costs in total. The average additional cost per household

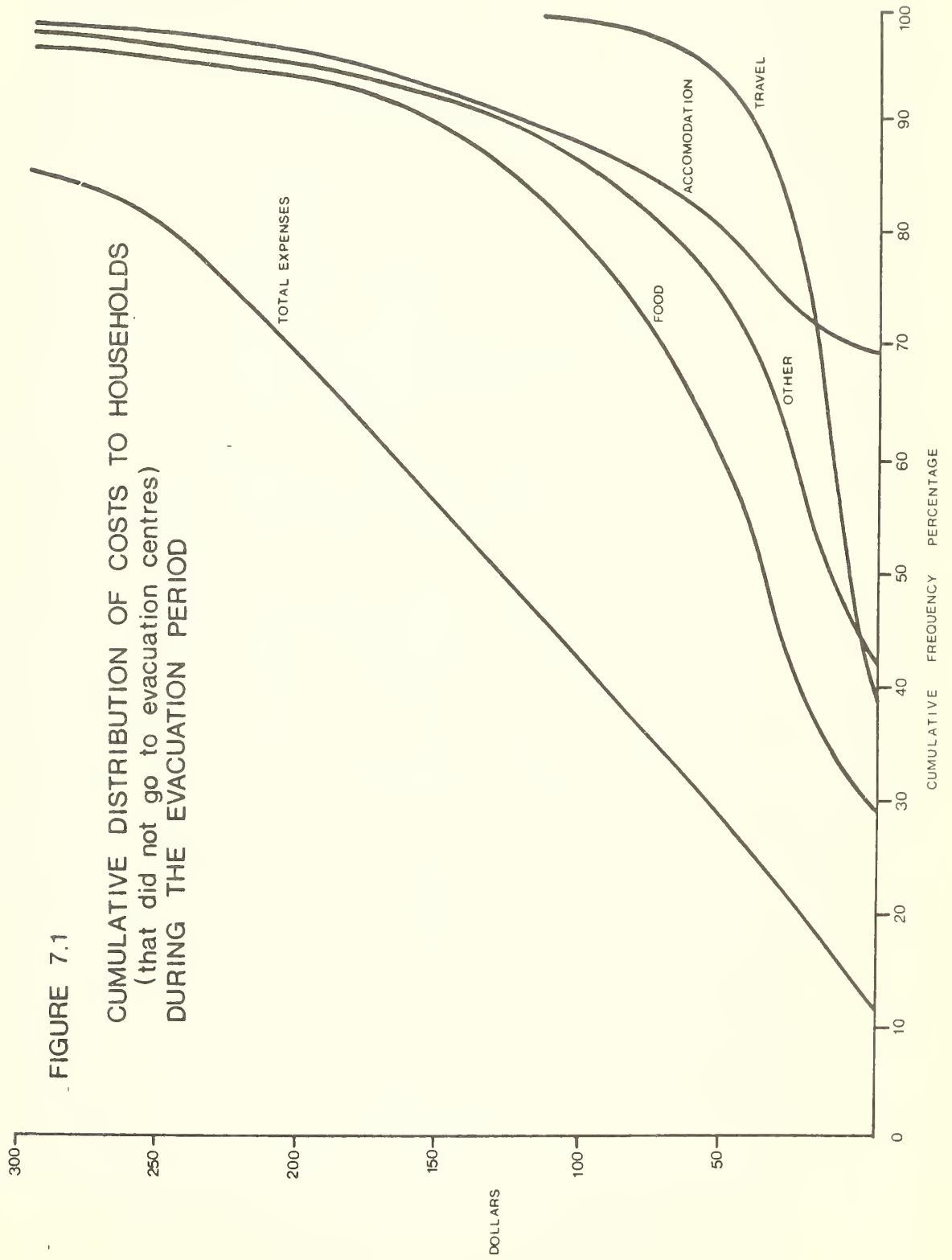


Table 7.3  
ESTIMATED ADDITIONAL COSTS BORNE BY HOUSEHOLDS IN  
THE EVACUATION ZONE DURING THE 5 DAYS AFTER RETURNING HOME<sup>1</sup>

Cost Category	% of Households Reporting \$0	% of Households Reporting Less Than \$40	Average per Household (\$)	Estimated Total Cost for Evacuation Zone (\$ million)
- Accommodation	99	99	1.4	0.1
- Food	72	86	13.7	1.0
- Travel	93	98	2.1	0.2
- Other	89	95	8.3	0.6
- Total (calculated)	-	-	25.5	1.8
- Total (reported)	66	80	27.2	2.0

<sup>1</sup>For the 71,725 households that did not go to an evacuation centre

calculated from the estimates for each category of expenditures is \$25.5. This compares with the total reported costs of \$27.2. Again, the discrepancy is due to the fact that not all respondents included a breakdown of additional costs by category. It is clear from Table 7.3 that additional food costs was the major category of expenses, accounting for just over half of the total calculated costs per household. The estimates of the average additional costs per household combined with the estimated number of households in the evacuated zone give total estimated costs for the evacuation zone during the 5 days after returning home of about \$2 million.

Figure 7.2 shows the distribution of these additional costs across all households. About 95% of the households incurred additional costs of \$100 or less. However, in the remaining 5% of households in Group 1, additional costs of several hundred dollars were reported.

#### 7.2.3. Estimated income lost by households going to private homes or hotels.

Table 7.4 reports the estimated income losses for up to three wage earners in each household<sup>1</sup>. Of the first income earners in each household, 73% reported no income loss and the average income loss to person One per household was \$78.4. This corresponds to an estimated total income loss for person One of over \$5.5 million. The estimated income losses for persons Two and Three are, as expected, considerably less than for person One, since a much smaller proportion of all households have two and three income earners than have one income earner. The total income loss on average per household in this group is estimated at \$111.6. This corresponds to

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1

*Unlike the interpretation of "no answer" in response to questions of additional costs, "no answer" in response to questions of income losses was interpreted as meaning that no income loss was involved.*

FIGURE 7.2

CUMULATIVE DISTRIBUTION OF TOTAL COSTS  
TO HOUSEHOLDS (that did not go to evacuation centres)  
IN THE FIVE DAYS AFTER RETURNING HOME

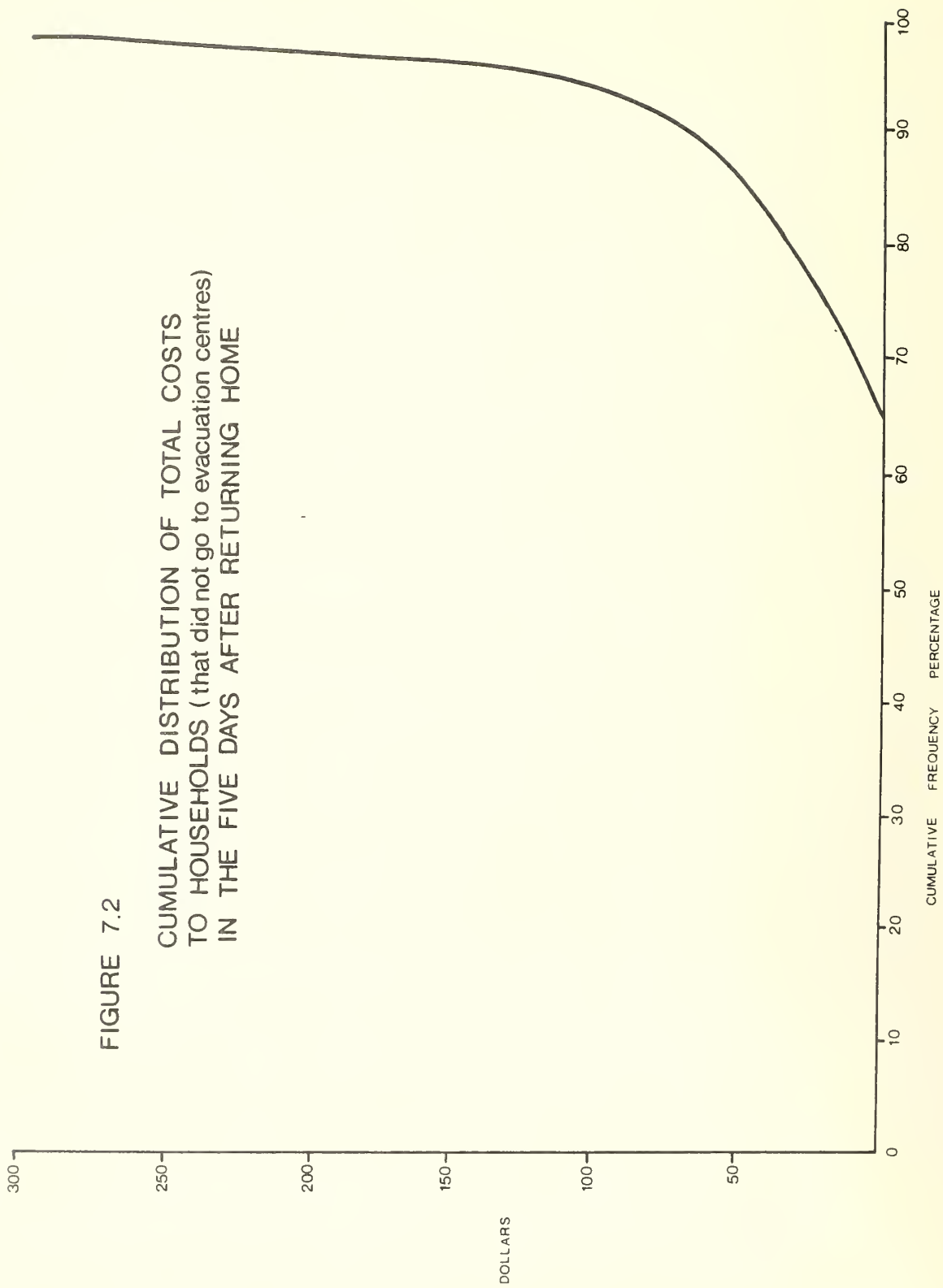




Table 7.4

ESTIMATED INCOME LOST BY HOUSEHOLDS IN THE EVACUATION ZONE<sup>1</sup>

Income Earners in Household <sup>2</sup>	% of Households Reporting no Income Loss for Person Indicated	Average per Household (\$)	Estimated Total Income Lost (\$ million)
Person 1	73	78.4	5.6
Person 2	88	31.2	2.2
Person 3	98	2.0	0.1
Total	-	111.6	8.00

<sup>1</sup>For the 71,725 households that did not go to an evacuation centre<sup>2</sup>Households can have up to 3 income earners

a total income loss for households that did not go to the evacuation centres of \$8 million.

Figure 7.3 shows the distribution of these income losses for persons one, two and three for each household. In the case of the first income earner, 95% of all households reported an income loss of \$400 or less. However, half of the remaining 5% of households reported income losses in excess of \$800 for person One and a few losses running into the thousands of dollars were indicated. Some of these large losses are likely to be due to reductions in the profits of businesses shut down by the evacuation.

The distribution of income losses for the second income earner in the household is somewhat similar to that for the first income earner with about 97% of all income earners reporting losses less than \$300. Virtually all of the income losses for the third income earner of each household were less than \$100.

#### 7.2.4 Estimated additional costs borne by households using Evacuation Centres

In comparison with Table 7.2, Table 7.5 shows that, on average, households that went to evacuation centres incurred higher costs in each category and in total (\$250) than did households going to private homes and hotels (\$175-200). The difference is statistically significant at the .05 confidence level. Since about 3,775 households went to evacuation centres, the total costs to this component of the evacuated population is estimated at over \$900,000.

#### 7.2.5. Estimated additional costs borne by households using Evacuation Centres during the five days after returning home

Table 7.6 shows that almost 50% of families that went to evacuation centres did not incur any additional costs in the

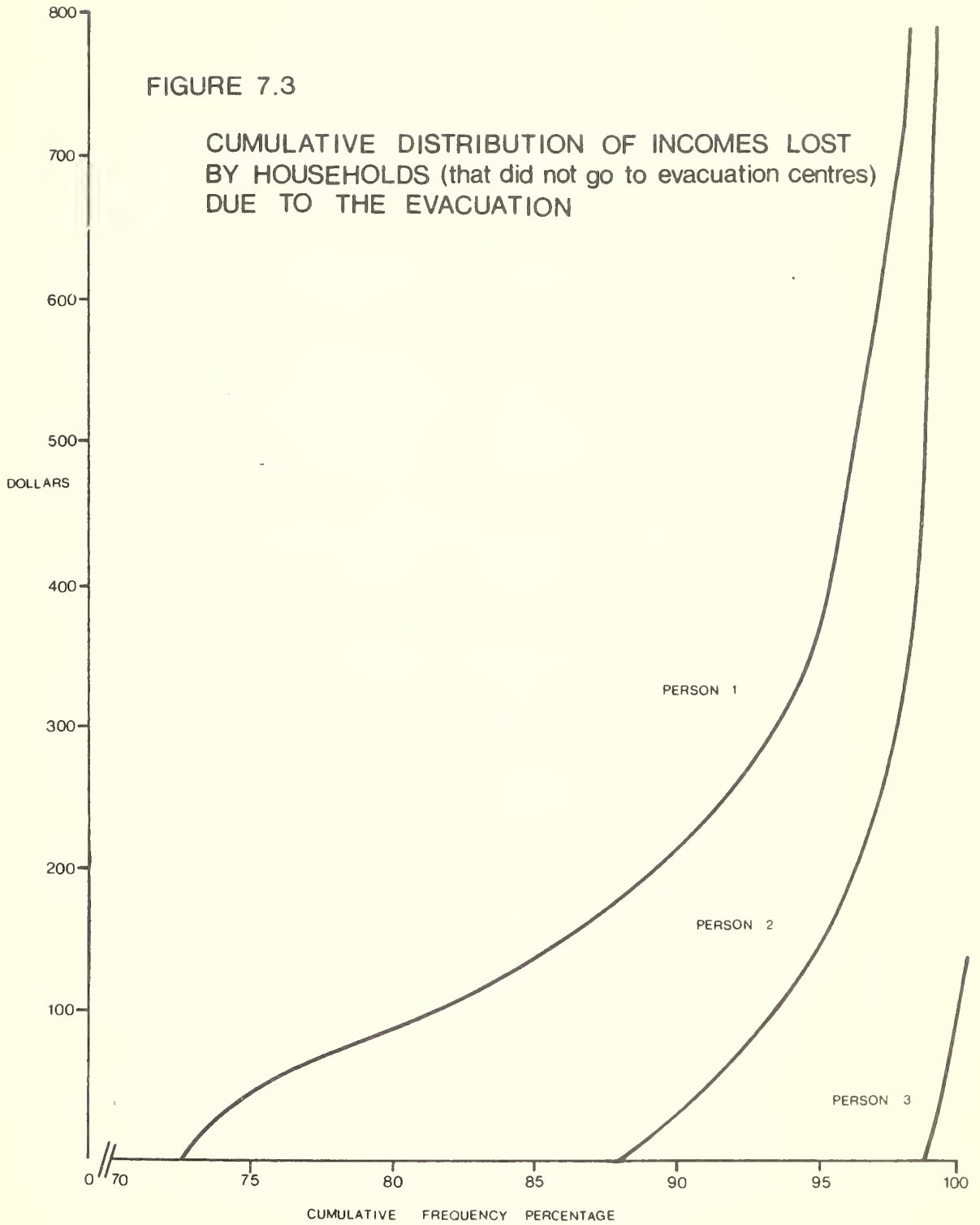


Table 7.5

ESTIMATED ADDITIONAL COSTS BORNE BY HOUSEHOLDS<sup>1</sup> USING EVACUATION CENTRES  
DURING THE EVACUATION PERIOD

Cost Category	% of Households Reporting \$0	% of Households Reporting Less Than \$40	Average per Household (\$)	Estimated Total Cost for Evacuation Zone (\$ thousand)
- Accommodation	59	66	53.8	203.1
- Food	18	40	91.6	345.8
- Travel	32	77	23.0	86.8
- Other	26	43	84.7	319.7
- Total (calculated)	-	-	253.1	955.5
- Total (reported)	4	18	247.1	932.8

<sup>1</sup> 3775 households

Table 7.6

ESTIMATED ADDITIONAL COSTS BORNE BY HOUSEHOLDS<sup>1</sup> USING  
EVACUATION CENTRES DURING THE 5 DAYS AFTER RETURNING HOME

Cost Category	% of Households Reporting \$0	% of Households Reporting Less Than \$40	Average per Household (\$)	Estimated Total Cost for Evacuation Zone (\$ thousand)
- Accommodation	96	97	2.3	8.7
- Food	58	73	29.2	110.2
- Travel	89	98	2.5	9.4
- Other	79	90	14.9	56.2
- Total (calculated)	-	-	48.9	184.6
- Total (reported)	48	67	49.9	188.4

<sup>1</sup> 3775 households

five day period after returning home. However, compared with those households that did not go to evacuation centres, a larger proportion did report additional costs. (The difference is statistically significant at the 0.5 confidence level). The average additional cost to households using Centres is estimated at almost \$50. This corresponds to a total additional cost in the post-evacuation period of about \$185,000 for this group.

#### 7.2.6. Estimated income lost by households using Evacuation Centres

Table 7.7 shows that the majority of income earners in these households did not incur any income losses as a result of the evacuation. In comparison with the families that went directly to a private home or hotel, a somewhat larger percentage of evacuation centre users reported income losses. The average loss per household was \$136.3. The difference is not statistically significant at the .05 level. The total income loss for those families that went to evacuation centres was over \$510,000.

#### 7.2.7. Economic costs of the evacuation: willingness to pay versus compensation

One way of interpreting the estimates of the out-of-pocket expenses and income losses presented above is to argue that people would have been willing to pay at least these sums to have avoided the evacuation. Many people might have been willing to pay far more than this to have avoided the disruption to their lives and the anxiety it may have caused them. On the other hand for some the evacuation was also a positive experience and these people may have been willing to pay less than their extra expenses and income losses. Considering only estimated costs and (post-tax) income losses



Table 7.7

ESTIMATED INCOME LOST BY HOUSEHOLDS IN THE EVACUATION ZONE  
THAT WENT TO THE EVACUATION CENTRES<sup>1</sup>

Income Earners in Household*	% of Households Reporting on Income Loss for Person Indicated	Average per Household (\$)	Estimated Total Income Lost (\$ thousand)
Person 1	64	94.6	357.1
Person 2	82	33.5	126.5
Person 3	95	8.2	31.0
Total	-	136.3	514.5

<sup>1</sup> 3775 households

<sup>2</sup> Households can have up to 3 income earners

Note: The reply "Can't remember" was dropped from sample; "no answer" was counted as \$0.

(Tables 7.2-7.7 and summarized in Table 7.8), households within the evacuation zone would have been willing to pay between \$22.5 and \$24.5 million to have avoided the evacuation. This corresponds, on average, to \$306 per household for those that did not go to an evacuation centre and \$411 per household for those that did.

This estimate allows an interesting comparison to be made. Since the work of J.R. Hicks and others in the 1940's, economists have believed that monetary measures of the economic value of something undesirable will tend to vary depending on whether one looks at people's willingness to pay to avoid a cost, or, in the event that the cost has already been incurred, at the compensation they would require in order to feel no worse off.

An important reason for this difference is that people's willingness to pay is constrained by their income; whereas compensation required is not so affected. Consequently, the difference between willingness to pay and compensation measures of cost can be expected to depend on the ratio of the cost to total income.

To arrive at an estimate of the total amount of compensation required by all households in the evacuation zone (Table 7.9), several assumptions were made in regard to responses to a question asking for the sum required to compensate households fully for all effects of the evacuation:

- the mid-point of each range given in the questionnaire was used as the average compensation required by that group;
- for the over \$2,000 range, \$2,500 was assumed to be the average compensation required
- the households responding that no sum would fully compensate them were dropped from the sample for this exercise.

Table 7.8

SUMMARY OF THE ESTIMATED COSTS  
TO HOUSEHOLDS IN THE EVACUATION ZONE

	High <sup>1</sup> (million)	Low <sup>2</sup>
<u>Households that did not go to Evacuation Centres</u>		
- Additional costs during evacuation period	14.3	12.6
- Additional costs in 5 days after returning home	2.0	1.8
- Income lost (post-tax) <sup>3</sup>	6.6	6.6
Sub Total:	<u>22.9</u>	<u>21.0</u>
<u>Households that did go to Evacuation Centres</u>		
- Additional costs during evacuation period	1.0	0.9
- Additional costs in 5 days after returning home	0.2	0.2
- Income lost (post-tax) <sup>3</sup>	0.4	0.4
Sub Total:	<u>1.6</u>	<u>1.5</u>
TOTAL:	<u>24.5</u>	<u>22.5</u>

1. Based on 'reported' estimates of total expenses.

2. Based on 'calculated' estimated of total expenses.

3. In 1978, income tax was 18% of total income in Mississauga: (Ontario Statistics 1980, p. 365.) Income post-tax is estimated to be 82% of income lost. If the marginal tax rate for the whole population exceeds this average tax rate, this procedure over estimates the post-tax income lost.

Table 7.9

ESTIMATED SUM OF MONEY CONSIDERED NECESSARY  
BY HOUSEHOLDS TO FULLY COMPENSATE THEM FOR  
ALL THE EFFECTS OF THE EMERGENCY

Sum Required to Fully Compensate the Household for all the Effects of the Emergency (\$)	Proportion of Households	
	Not Going To Evacuation Centres	Going to Evacuation Centres
0	39	28
1 - 500	32	24
501 - 1,000	10	11
1,001 - 2,000	4	8
over 2,000	3	7
No amount can fully compensate	12	22
	—	—
	100	100

Under these assumptions, the average compensation required by each household going directly to private houses and hotels is \$346; for those going to the evacuation centres it is \$573. The total sum required by all households is estimated to be \$27 million. This estimate does not fairly reflect the view of those households who reported that no sum of money would fully compensate them.

This finding that the total compensation required by the evacuated households exceeds the willingness to pay to have avoided the evacuation (as estimated from their out-of-pocket expenses and income lost) is consistent with economic theory. However, it is a result that must be treated with caution since the estimate for compensation probably includes some allowance for disruption and anxiety, factors that were excluded from the willingness to pay estimate.

Another interesting inference from the responses to the survey question on compensation is the suggestion that people who went to evacuation centres felt that they bore a greater cost on average than those who went elsewhere. Table 7.9 indicates that the distribution of required compensation is skewed upward for the sample of households that went to the centres, relative to the sample of households that did not.

These results do not indicate whether people ought to pay something to avoid evacuations (though through taxes and other means they do) or whether they should be compensated if they are evacuated. Neither does this estimate of compensation required have any direct bearing on the claims for compensation that were submitted to CP Rail. As Table 7.10 shows, these claims amounted to an average of \$157 per household, for those that did not go to evacuation centres and \$250 per household for those that did. These sums are only about 45% of what people

Table 7.10

## CLAIMS SUBMITTED TO CP RAIL AND COMPENSATION RECEIVED

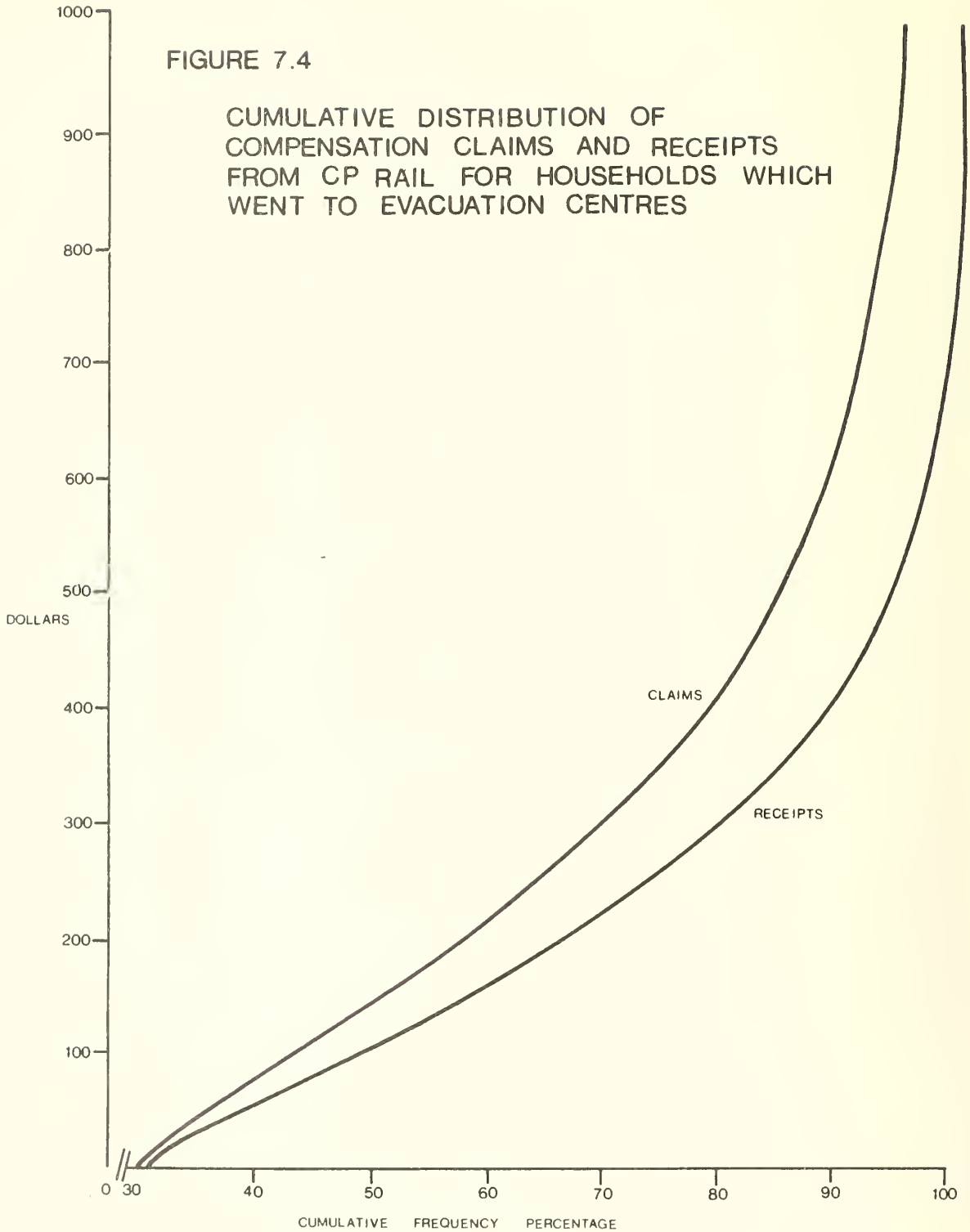
Households	CLAIMS			RECEIPTS		
	% Households Reporting \$0	Average per Household (\$)	Estimated Total (\$ million)	% Households Reporting \$0	Average per Household (\$)	Estimated Total (\$ million)
That did not go to evacuation centres	43	156.9	11.3	45	113.9	8.2
That did go to evacuation centres	30	250.0	0.9	32	170.2	0.6
Total	-	-	12.2	-	-	8.8

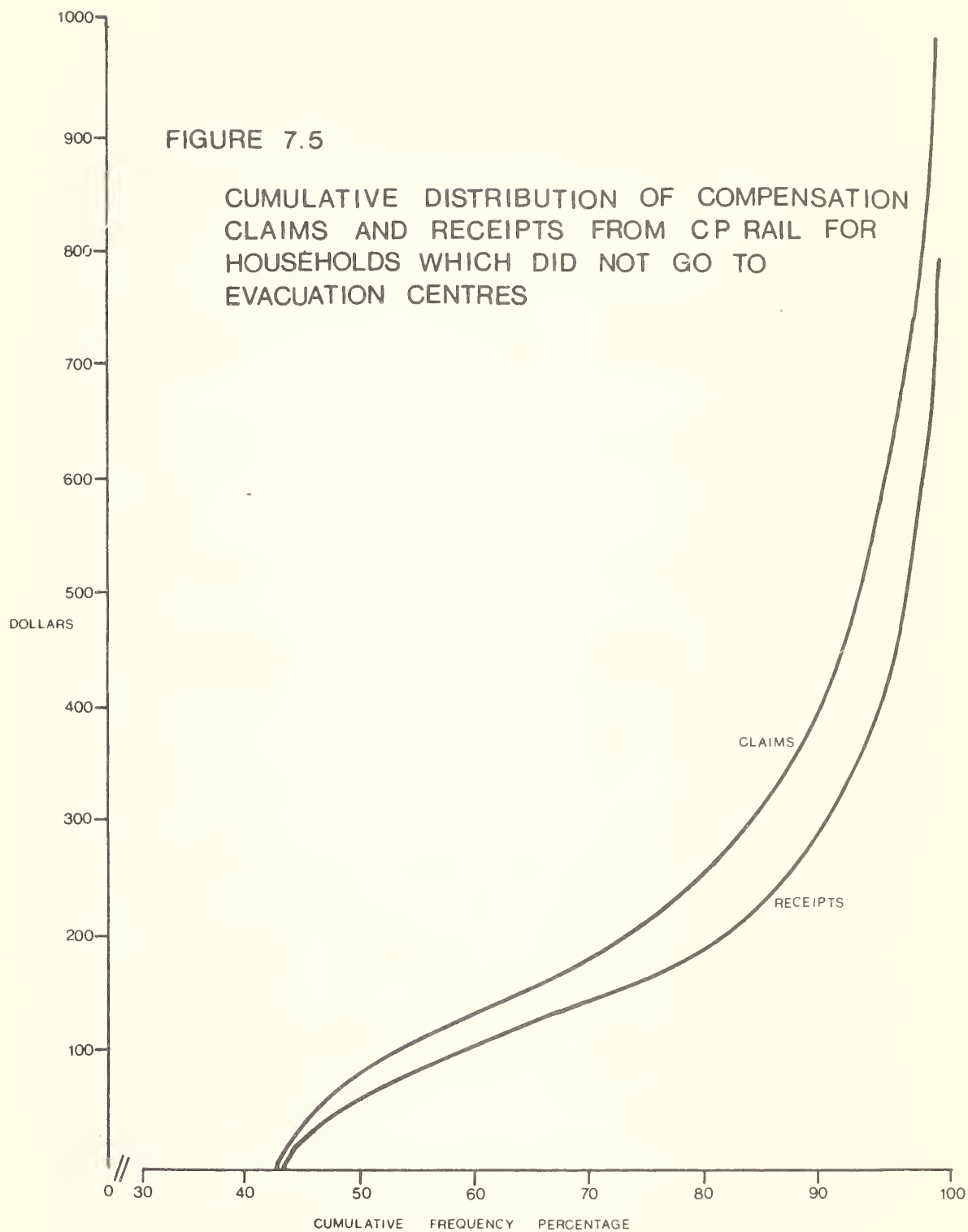


say would have fully compensated them (neglecting those for whom no such sum was reported). Furthermore, on average, only 73% of the sums claimed were actually paid by CP Rail (the total compensation paid as estimated in the questionnaire survey, \$8.8 million, is not significantly different from the figure of \$9.6 million reported by CP Rail at the .05 confidence level). The cumulative distribution of these claims and receipts are shown in Figures 7.4 and 7.5.

FIGURE 7.4

CUMULATIVE DISTRIBUTION OF  
COMPENSATION CLAIMS AND RECEIPTS  
FROM CP RAIL FOR HOUSEHOLDS WHICH  
WENT TO EVACUATION CENTRES





7.3. AN ANALYSIS OF HOUSEHOLD COSTS IN RELATION TO  
EVACUATION LOCATION

The discussion so far has distinguished between households that went first to evacuation centres and those that went directly to private homes and hotels. It is interesting to consider a more detailed breakdown of household costs in terms of evacuation location. Relevant information obtained from the questionnaire responses is presented in Table 7.11.

Households have been classified according to the first location to which they evacuated. Only for those who first went to an evacuation centre is it possible to identify households who did not go elsewhere during the evacuation period. Information about this sub-set of households (only 14 out of the 175 households that responded to the Evacuation Centre survey) is contained in the last row of Table 7.11.

Table 7.11 shows that:

- a) average household costs borne by all households that first went to evacuation centres were nearly three times those of the households which remained in the evacuation centre throughout the evacuation. When allowance is made for differences in household size and the number of days households were evacuated, the difference falls to just less than 2:1 as shown in the last column of the table. Nothing is known about the second location of those who left the evacuation centres and went elsewhere. From the information on average household costs it seems that a significant proportion may have gone to hotels.
- b) those households that went to hotels bore the highest costs, followed by those that went to friends and then those that went to relatives. Variations in household size and number of days evacuated counteract each other so that the relative differences in household cost and household cost per person/day are almost identical.

Table 7.11

## HOUSEHOLD COSTS DURING THE EVACUATION AND EVACUATION LOCATION

First Evacuation Location	Average Household Cost During Evacuation	Average Household Size	Average Household Cost Per Person	Average Number of Days Evacuated	Average Household Cost Per Person/Day
Evacuation Centre	247.1	3.7	66.8	4.7	14.2
Friends	211.0	3.3	63.9	3.9	16.4
Relatives	153.1	4.0	38.3	3.2	12.0
Hotel	438.6	3.1	141.5	4.1	34.5
Only Evacuation Location Evacuation Centre	84.9	3.6	23.6	3.1	7.6

- c) the lowest household costs, in total and on a per person per day basis, were borne by households which remained in the evacuation centres the entire period.

In summary, Table 7.11 shows clearly that household costs and cost per person per day varied markedly according to the evacuation location. Comparing each group with each other group, these differences in the average household costs were found to be statistically significant on the .01 level in all cases. What turns out to be a far more difficult task is to explain statistically the variation in household costs within each group. Various attempts were made to specify relationships between household costs and such factors as household size, days away from home, distance evacuated, and income level. These relationships were estimated using multiple regression techniques and the most satisfactory regression equations were as follows:

First Evacuation Location	Equation	Adjusted $r^2$
Evacuation Centre (only location)	$HC = 7.9D^2$ (1.7)	0.61
Friends	$HC = 0.4 + 8.0D^2 + 5.2S^2$ (1.1) (1.4)	0.38
Relatives	$HC = 38.1 + 3.8D^2 + 3.7S^2$ (0.7) (1.0)	0.14
Hotel	$HC = 85.9 + 8.2D^2 + 9.8S^2$ (3.2) (4.1)	0.24
<p><u>Where:</u> HC = total household costs, D = days away from home, S = household size, and</p> <p>numbers in parentheses are the standard errors for the estimated coefficients.</p>		



The adjusted  $r^2$  values for equations 1 to 4 show the proportion of the variation in household costs for each group that is "explained" by the respective equation. In the case of those households that went only to an evacuation centre (a sub-sample of 14 of the 175 households in the evacuation sample), the equation explains 61% of the variation in household costs. The only explanatory variable which is statistically significant is the number of days away from home. Under the assumption of a quadratic relationship, the first day's cost for this group was only about \$8 per household on average. This rose to \$24 per household for the second day and to \$40 per household for the third day.

In equations 2, 3 and 4, household size and days away from home proved to be statistically significant in explaining some of the variation in household costs. It is interesting that for the groups that went first to friends and hotels, the coefficient estimated for days away from home is virtually the same as for the evacuation centre group. This means that, other things equal, the incremental cost of a day's evacuation was very similar for all three groups.

However, the incremental cost of a day's evacuation was considerably lower for households that went to relatives. As might be expected the importance of household size in determining costs is greatest for households that went to hotels, somewhat less for those that went to friends, and less still for those that went to relatives. It is not a significant variable in the case of those that stayed exclusively in evacuation centres.

The low  $r^2$  values for equations 2, 3 and 4 may be partly explained by the fact that the questionnaire responses did not allow identification of those households that went to friends, relatives or hotels and remained there throughout the evacuation. Hence, the samples used for estimating equations 2 to 4 were not as pure as that for the evacuation

centre where it could be established which households remained in the centres throughout the evacuation period. Other explanatory variables, such as income and distance evacuated, were tested but found to be insignificant.

The difficulty of explaining more than a small proportion of the variation in household costs through regression analysis suggests that the variety of arrangements within each group was considerable. Some people paid nothing or virtually nothing to friends or relatives, whereas others paid considerable amounts. Some people spent hundreds of dollars in hotels whereas others shared rooms and paid comparatively little. Had it been possible, incorporation of information on these kinds of arrangements would probably have done much to improve the explanatory power of the regression equations.

#### 7.4. PUBLIC SECTOR COSTS

Agencies representing all four levels of government which have responsibilities in Mississauga were involved in some way during the emergency: the City of Mississauga, the Regional Municipality of Peel, the Province of Ontario, and the Federal Government. Details of this involvement and that of other organisations in neighbouring jurisdictions as well as volunteer agencies are provided in Chapters 2, 3, and 4.

In estimating the costs borne by the public sector, a decision had to be made whether to include all the costs incurred (such as, the full cost of providing the emergency services used) or only those in excess of normal requirements. Since it is a primary function of government to provide such service at all times it can be argued that it is only the excess costs which are properly attributable to the Mississauga evacuation. This is the position taken in this study.

In the sections which follow, estimates of the costs to each level of government involved in the evacuation are provided. The City of Mississauga, the Regional Municipality of Peel and the Provincial Government each provided their own estimates which were originally put together for internal accounting purposes. The level of detail and scope of coverage of these estimates do not correspond exactly. However, to the extent possible, the estimates are presented in a manner intended to facilitate comparison.

The only Federal agency for which cost data were obtained in this study was the Royal Canadian Mounted Police. Similar cost data were provided by the Metropolitan Toronto Police Force.

#### 7.4.1. Costs to the City of Mississauga

Table 7.12 presents a detailed summary of the additional costs incurred by the City as a result of the emergency. The columns are defined by department and the rows by expenditure type (e.g. wages and salaries, materials and supplies) and item. More than 60% of the total estimated costs of \$1.6 million is due to direct damage to buildings and their contents caused by the explosions and fire at the crash site. Overtime wages and salaries account for a further 10% and materials and supplies 12%. The remaining 15% of the estimated total costs are divided among wages for labour used unproductively (4%), fixed costs wasted during the evacuation (4%), and lost revenues (7%). These items require some further explanation.

Unlike the case of the business sector, most of the services provided by the public sector are not sold to the users. Hence there is no market price with which to estimate the value of an interruption of these services. One important

Table 7.12

## PUBLIC SECTOR COSTS: THE CITY OF MISSISSAUGA

(\$)

Department	Fire	Mississauga Transit	Buildings	Engineering and Works	Recreation and Parks	Information and P.R.	Treasury and Others	Total
<u>EXPENDITURE</u>								
Damage to Buildings and Contents	0	0	0	0	0	0	956,507	956,507
Damage to Vehicles	0	0	0	0	0	0	44,215	44,215
Overtime Wages and Salaries	63,681	30,790	451	38,156	25,517	1,946	4,835	165,376
Wages for Unproductive Time	0	0	0	0	14,930	0	55,732	70,662
Fire Fighting	95,031	120	0	920	0	0	3,633	99,704
Municipal Administration	0	0	0	0	0	0	288	288
Clean-up Operations	0	0	0	11,741	0	0	0	11,741
Communications	0	787	44	0	74	989	0	1,894
Health and Welfare of Citizens	0	0	0	0	0	0	285	285
Engineering and Public Works	0	0	0	11,673	0	0	0	11,673
Equipment Rental and Accommodation	0	1,009	7	8,577	11,793	0	30,232	51,618
Miscellaneous	0	53	0	865	16,915	2,025	2,319	22,177
Lost Revenue	0	80,000	0	0	0	0	30,000	110,000
Fixed Costs Wasted During Evacuation	0	0	0	0	0	0	60,000	60,000
<b>TOTAL:</b>	<b>158,712</b>	<b>112,759</b>	<b>502</b>	<b>71,932</b>	<b>69,229</b>	<b>4,960</b>	<b>1,188,046</b>	<b>1,606,140</b>

Source: Adapted from information provided by the Finance Department of the City of Mississauga.

exception in this regard is the Mississauga transit system, which was out of service during the evacuation. The revenues lost by the Mississauga Transit Commission are included as a real cost insofar as they reflect the value of the lost public transportation services due to the evacuation. Similarly revenues lost at the city's community centres also indicate the value of services that were not available to people because of the evacuation.

The lack of market prices for valuing the reduction in services provided by the City makes it difficult to estimate the economic costs involved. One way around this requires the plausible assumption that people value these services at, or above, the costs of providing them (if they did not, presumably political pressures would be exerted to reduce the commitment of funds to these services). Consequently, the wages paid to labour that was unproductive, and the fixed costs that were wasted during the evacuation represent what is probably a low estimate of the value of these foregone, non-marketed services, normally provided by the City of Mississauga. These costs are included in Table 7.12.

#### 7.4.2. Costs to the Regional Municipality of Peel

Table 7.13 summarized the costs to the Regional Municipality of Peel. These are the Region's own estimates of the additional costs, over and above what would have been incurred under normal circumstances. By far the most important component was overtime costs incurred by the regional police force: over 80% of the total.

For purposes of comparison, the costs to the City of Mississauga in the categories of expenditures used by Peel are as follows:

total wages and salaries = \$165,377 and total materials = \$177,203.

Table 7.13  
COSTS TO THE REGIONAL MUNICIPALITY OF PEEL

(\$)

Account	Department	Police	Sanitary Sewer	Waterworks	Engineering and Admin	Waste Management	Social Services	Planning	General Government	Total Peel
Direct Labour		-	2,692	8,878	44	2,211	-	-	-	13,825
Salaries		155,715	-	-	-	-	31	203	-	155,949
Fringe Benefit		23,228	-	-	-	-	-	245	-	23,473
Total Wages & Salaries		178,943	2,692	8,878	44	2,111	31	448	-	193,247
Materials & Supplies		22,767	-	122	2	-	6,101	18	-	29,010
Purchased Services		166	-	120	1,000	-	4,095	7	101	5,489
Cost of Water Used		-	-	15,489	-	-	-	-	-	15,489
Total Materials		22,933	-	15,731	1,002	-	10,196	25	101	49,988
TOTAL:		201,877	2,692	24,609	1,046	2,211	10,227	473	101	243,235

\*From Table      excluding damages to buildings and vehicles, wages for comparative time, wasted fixed costs, and lost revenue.

Source:      Office of the Treasurer and Commissioner of Finance, the Regional Municipality of Peel

It is clear that, even on the basis of the narrower cost definition used in the estimates for the Regional Municipality, the costs to the City were considerably greater than those of the region. If other items are included in the comparison, especially direct damages to buildings and vehicles, the difference in total costs to the two levels of government becomes much greater.

#### 7.4.3. Costs to the Metropolitan Toronto Police Force

The Metropolitan Toronto Police Force committed 1,667 person days during the evacuation. This involved an estimated additional salary expense of \$249,192. Vehicle costs of \$8,510 were also incurred by the Force including \$1,640 for mobile sound truck equipment (all estimates provided by the Metropolitan Toronto Police Force).

#### 7.4.4. Costs to the Province of Ontario

Estimates of the costs borne by the Ministries and agencies of the Province of Ontario are summarised in Table 7-14. The major costs were incurred by the Ministries of Environment, Health and Labour, all of which had responsibilities for surveillance, monitoring and testing to ascertain the extent of the possible risks confronted by the public. Most of the costs attributed to the Ministry of the Solicitor General were for the personnel and equipment provided by the Ontario Provincial Police.

#### 7.4.5. Costs to the Federal Government

The only federal agency to incur additional costs of any magnitude because of the emergency was the R.C.M.P. Fifty-two men per shift were committed for 3 shifts a day over a 7 day period. The overtime incurred amounted to \$43,453 and approximately \$500 was expended for food. Twenty-six vehicles were utilised but no record of vehicle expenses was maintained.



Table 7.14

## COSTS INCURRED BY PROVINCIAL MINISTRIES AS A RESULT OF THE MISSISSAUGA DISASTER

Name of Ministry	Salaries (see below) (a)					Travel, Meals, Accom. etc. Supplies Equip. Office Rent	Rental air Monitoring Equipment	Ministry Programs, Subsidies, Grants, etc.	Organi- sations asked to assist	Total
	1 \$	2 \$	3 \$	4 \$	5 \$					
Gov't Services		10,389.86								10,389.86
Attorney General	2,047.00		1,883.00			2,190.00		23,035.00		29,155.00
Sol. General			106,335.00	151,300.00		24,324.00				281,959.00
Environment	400.00	3,000.00	50,000.00	13,000.00	5,000.00	6,000.00	97,000.00	(b)	(c)	174,400.00
Corp. & Soc. Serv.				26,000.00		3,500.00		25,000.00	42,300.00	96,800.00
Health								199,740.33		199,740.00
Housing	1,106.13	1,345.95		1,027.47		144.41				3,623.96
Labour			17,500.00	900.00		9,270.00		21,730.00		49,400.00
Trans. & Comm.		3,768.26		8,235.16		7,110.45				19,113.87
Civil Ser. Comm.	651.18									651.18
Northern Affairs	525.83									525.83
Educ./Coll./Univ.										
TOTALS	4,730.14	18,504.07	175,718.00	204,085.86	5,000.00	59,054.09	97,000.00	269,505.33	42,300.00	875,897.49

(a) Salaries: 1 Staff absent from work because of domestic evacuation.

2 Staff prevented from attending work in the disaster area because of entry restrictions.

3 Staff actually working on emergency activities.

4 Staff overtime due to the emergency.

5 Temporary help due to the emergency.

(b) \$15,000 increase in subsidy to M.R. Centre, Mississauga.

(c) \$10,000 loss of revenue, M.R. Centre, Mississauga.

(c) Canadian Forces: \$32,300

Canadian Red Cross: 10,000

Source: Ontario Ministry of the Solicitor-General

7.5. BUSINESS SECTOR COSTS

The City of Mississauga was not only "evacuated" in the 24 hours following the Saturday midnight derailment - it was shut down. At 00:30 on Monday, November 12th, Mayor McCallion declared the evacuated area to be closed. The normal Monday morning start to the production of goods and services in a sizeable and thriving urban economy was not to take place and, as it turned out, business-as-usual was not to be reestablished until the following week. In economic terms, just as the services of the housing stock were lost to the residents of Mississauga during the evacuation period, so the flow of good and services normally produced with the city's stock of business capital was abruptly turned off. One of the major costs of the mishap was the value of the goods and services foregone due to this interruption in productive activity.

In an attempt to account for such a loss of economic welfare it is always difficult to define the geographic area or group of people to be considered. It has been decided here to focus upon the effect on business activity within the evacuated area.

Other effects outside of the city arose because of normal interdependence within the business sector. Firms in Mississauga supply materials, services, and markets to other firms outside of Mississauga. An interruption of the flow of such supplies or of the availability of markets, even for a period as short as a week, can interfere with production. These firms also bore some of the burden of the emergency. Although such effects may have been more concentrated in areas close to Mississauga, they are in general widely transmitted to other parts of the domestic economy and even internationally.

The above discussion also draws attention to two other matters. First, in the preceding sections on the economic impact of the accident on households, the study considered the costs borne by residents of the evacuated area. Here the focus is on the interruption of business activity located within the evacuated area. But the people to whom the losses accrue - the owners and employees of the firms that were closed and the consumers of what is produced by the firms - live both inside and outside of it.

Second, some of the costs that accrue to owners of Mississauga firms are not really "costs" from the point of view of the whole society (for example, all residents of Ontario). Some business lost by firms in Mississauga will have been gained by firms elsewhere in the province. What is involved is a transfer of income from one group to another group, both part of the larger community. On the other hand, some of the costs are genuine burdens of the whole society: production foregone in Mississauga that was not made up elsewhere during the emergency or in Mississauga afterwards. A more comprehensive study would involve an attempt to separate the transfers from the more fundamental costs.

#### 7.5.1. Measuring Economic Losses to the Business Sector

Two measures of the loss in economic welfare due to the evacuation were considered in this study: the reduction of profits accruing to firms operating in Mississauga and the reduction in the net value of goods and services (i.e., in "net value added") produced by those firms. The profit measure is familiar; it identifies the burden of the mishap to the owners of the firms affected. The second measure - net value added - applies to a broader group that includes

the workers that would have produced the goods and services foregone, as well as to the owners of the producing firms.

The net value added to production by a firm in a given year is defined as the gross value of the firm's product during that year minus the value of its purchases from other firms. This is a more informative measure to use in regard to the output loss during the evacuation period than the total value of production, especially if one wants to focus primarily on production foregone by firms located in Mississauga. A measure of net value added excludes the value of materials and other inputs produced outside the evacuated zone and/or before the evacuation period.

To grasp this more fully consider first a firm that has on hand an inventory of materials or intermediate goods that it would have used during the closed-down period. If these intermediate goods were not so perishable as to spoil during that period, they will have been used afterwards and their value will not have been lost. What was lost during the evacuation period is the value of the further processing that would have been done within the firm. If the intermediate goods did not spoil during the period of closure (and "materials" or "intermediate goods" should be broadly interpreted to include such things as inventories of food in retail stores), their value would be accounted for by this measure because the firm's net-value added for the accounting period would be reduced accordingly. That is, in the net-value added calculation, the (positive) revenue, that would normally be set against the (negative) cost of the spoiled materials, will not have been received.

Now consider a second firm in which the production of a week's output normally involves materials or services delivered within that same week. There are two possibilities:

(a) if the firm's supplier is also within the evacuated zone normal production of these intermediate goods will also have been foregone, but their value is accounted for by a net-value added calculation for the supplier, not for the firm that uses the goods; (b) if, on the other hand, the supplier is outside of the evacuated area, its production need not be lost, though it may be if it cannot find alternative buyers or if the material cannot be stockpiled. In any event the lost production of such a firm could clearly not be included in the output lost within the closed sector.

As a measure of welfare lost by consumers, the reduction in net value added due to an interruption in production is a potential (rather than an actual) loss, because some of the consumption can be replaced by goods and services produced elsewhere in the economy during or after the period of closure, or within the closed sector after it reopens. However, such replacement is not likely to be complete. While there is always some excess capacity available to supply sudden increases in demand, it is not likely to be sufficient to replace all lost production and what is available cannot always be brought into play on short notice to produce the specific goods that need to be replaced.

As income, net value added can be broken down into: the wages and salaries of the workers who produce it; the profits and return on capital and land received by the owners of the firms involved; and the taxes paid to government. However, the proportions of net value added that accrue to employees and employers in normal times are not likely to apply to the reduction in net-value added due to a single stoppage of production for a week. Employers are likely to bear a considerably higher proportion of the loss relative to their normal share of net value added.

A firm that went bankrupt.....

The impact of a public emergency on the fortunes of a business can depend very much on when it occurs. For a small engineering firm, with offices located near the scene of the derailment, the required closing could not have come at a worse moment. At the time of the accident, the firm was having difficulty completing a large job due to events beyond its control. As a result, a projected payment to the company was deferred and it was consequently short of cash, to an extent sufficient to worry both the firm's management and its bank.

When the emergency occurred, the firm attempted to continue operating out of an office in a hotel, but it was a frustrating operation. Activities were hampered not only because company files were inaccessible, but also because a large and expensive piece of equipment which had been rented for the job was parked in the evacuation zone. Work on the project was held up for about 10 days.

During this period, the firm continued to pay all regular salaries and wages. Hourly paid employees hired by the firm do specialized work. Laying them off, due to the emergency, would likely have created still further delay afterwards.

A claim of \$9,000 was filed for expenses directly related to the shut-down. But this may understate the actual impact. The firm declared bankruptcy not long afterwards. The former owner believes that it could well be operating today if its activities had not been disrupted by the Mississauga emergency.







They will bear the burden of spoiled inventories and other special costs. Many employers are likely to continue to pay wages and salaries in such a situation, particularly to those employees not paid on an hourly basis. The household and business surveys indicate that, though some employees lost income, others did not experience an interruption in pay. The latter group apparently included even hourly-paid employees, although detailed information was not collected.

Both of the measures of the economic burden of business closing considered here are well known accounting variables upon which data are widely collected and published. Despite this, an attempt to construct dependable estimates of the actual reductions in net value added and business profits due to the Mississauga closing is difficult, and is impossible at the level of accuracy one normally expects in regard to these variables. The accounting systems of individual business units are not set up to handle such an unusual occurrence. Some firms with which the study team has been in contact have made estimates, but these are typically only rough approximations. Furthermore, one cannot assume that the estimate of any given firm is comparable with the estimates of other firms, since various common assumptions would be necessary for comparability. Whatever data of this nature have been gathered in the course of the study have to be viewed as anecdotal at best. Attempts to understand the magnitude of the costs to the business sector that are described in the following sections are based on different types of data.

7.5.2. An analysis of the impact on net value added

Since regional breakdowns of national product accounting and related data are available, it is possible, in principle, to calculate the daily output of the business sector in a particular locality. If the world were simple, one could do this for Mississauga's business sector, then multiply this number by the average number of days during which firms were closed. This would supposedly provide an estimate for the local output loss due to the accident.

The world is not that simple. But such a calculation, viewed in perspective and with caution, can still be useful in order to make a judgement about the orders of magnitude involved. Was the lost production in the hundreds of thousands of dollars? Millions? Hundreds of millions? It may also be possible to conclude the likely direction of the bias in such a number, in the sense that one may be able to argue that the true number is likely to be, say, lower than the number calculated.

Unfortunately the statistical agencies do not estimate production specifically for Mississauga on a comprehensive basis. From the available data, the figure that most closely approaches our needs is an estimate of aggregate annual net value added in Mississauga's manufacturing sector.

In 1977, the latest year for which data are available, net value added in Mississauga's manufacturing sector amounted to \$831,203,000.<sup>1</sup> Applying aggregate manufacturing growth rates to adjust the figure to 1979 levels results in an

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<sup>1</sup>Statistics Canada (1977) p.271. This number refers to the broad definition of manufacturing activity, which includes administrative and related activities as well as the more narrowly defined manufacture of goods.

estimate of \$1,118 million.<sup>1</sup> In the absence of an estimate of the average number of working days per year in manufacturing it is assumed for the sake of this analysis that factories worked 5-day weeks. They would then operate 260 days per year, assuming no closings for annual vacations. On this basis, the daily net value added in Mississauga's manufacturing sector in 1979 was \$4.3 million.

The business survey (see Appendix 2) reported on in the next section provides an estimate of the average number of days closed due to the evacuation. On average, firms were closed for 3.8 days. Thus, based on average annual estimates, and some plausible assumptions applied in order to keep the calculation simple, the net value added lost due to the closing of Mississauga manufacturing sector would be \$16.3 million.

Again with simplifying assumptions, this number can be expanded to include production in other sectors as well as manufacturing. To do this one needs a percentage breakdown of annual production into its broad industrial components. In order to have sufficiently detailed breakdown, it was necessary to use data on real domestic product for the whole Canadian economy.<sup>2</sup> Based on the 1979 weights used to categorize real domestic product by industry, manufacturing accounts for 23% of total output. The service producing industries have a weight of 59%. However, the latter figure

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<sup>1</sup>A growth rate of 14.6% is available for the Ontario manufacturing sector for 1977-8: (Statistics Canada, 1978, p. 94). For 1978-9, the growth rate of 17.4% for total manufacturing shipments for all Canada was used (Statistics Canada, 1981, p. 68).

<sup>2</sup>The weights used are from Statistics Canada, 1980.

includes various activities in the public sector. While the weights for public and private service activities cannot be precisely separated, taking out the most important public sector categories results in an estimate of the private service sector's output as 40% of the total.<sup>1</sup>

The remaining components of total product are the primary goods-producing industries (11%) and construction (7%). The former industries (such as forestry, mining and agriculture) are likely to play a very small role in an urban economy in southern Ontario; it is here assumed that it is so small in Mississauga as to warrant a zero weight. For this study the output of Mississauga's business sector is assumed to consist of manufacturing, construction, and private service industries in the approximate proportions 23:7:40, which imply relative shares of 33%, 10% and 57% respectively.

On this basis, the average net value added per day by Mississauga's business sector in 1979 was \$13.2 million, made up of \$4.3 million in manufacturing, \$1.3 million in construction, and \$7.6 million in the service sector. The average net value added in a period of 3.8 days would be \$50.2 million. These calculations are summarized in Table 7.15.

#### 7.5.3. Limits to the analysis of impact on net value added

If one wants to use these numbers as a guide to the net loss of production due to the emergency, it is advisable to consider the ways in which they could be in error. The major sources

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<sup>1</sup>The sectors removed were Education, Health and Welfare, Public Administration and Defence. These components include some private sector activities such as physicians in general practice. On the other hand, some of the industries not removed involve some public sector activities.

Table 7.15

Average Net Value Added by  
Mississauga's Business Sector

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	Per day	Over average closing period of 3.8 days
	\$ million	
Manufacturing sector	4.3	16.3
Construction sector <sup>1</sup>	1.3	5.0
Service sector <sup>2</sup>	<u>7.6</u>	<u>28.9</u>
TOTAL	13.2	50.2

NOTES

1. Based on a calculated ratio of construction output/  
manufacturing output of 0.307.
2. Based on a calculated ratio of service sector  
output to manufacturing output of 1.767.

of potential error are as follows:

- (a) less than the whole of Mississauga was closed down. Since business is not spatially distributed in a uniform manner, and we have little specific information on the business concentration in the closed part relative to the part that was not closed, a simple adjustment to account for this matter is impossible;
- (b) Some portion of the production foregone was replaced by extra production after businesses reopened;
- (c) some businesses operate more than 5 days per week and some close down for annual vacation periods. The former is probably a larger source of inaccuracy than the latter, which means that our assumption of 260 working days per year is too low. A higher number would decrease our estimate of average daily output. Therefore, this issue leads to an upward bias in the results in Table 7.15;
- (d) spoilage in inventories has to be added to the production foregone during the emergency in order to calculate the total loss;
- (e) there are minor seasonal variations in manufacturing output, the basis of the above calculations. In Canadian manufacturing as a whole, November's output is slightly higher than average.<sup>1</sup> There is no reason to believe that Mississauga's output differs from the national seasonal average in one direction or another. Thus, the time output loss per day of closure could be greater than the annual average because the accident happened to occur in a month of high

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<sup>1</sup>The ratio of seasonally adjusted to seasonally unadjusted manufacturing shipments in November 1979 was 0.978. This is not a large adjustment: for example, the largest downward adjustment in 1979 occurs in May, when the ratio was 0.930. It must, however, be allowed for.

production. Furthermore, this fact might have reduced the ability of some companies to replace lost output after reopening, because their production facilities would already have been working closer to full capacity;

- (f) seasonal variation in the service industries is not likely to differ dramatically from that in manufacturing, but the volatile nature of construction activity makes that component of our calculation questionable. Because construction spending varies so much from place to place through time, a seasonal adjustment based on past national averages would not be very dependable when applied to a particular city;
- (g) the composition of Mississauga's domestic product is not necessarily identical with the make up of real domestic product for the whole Canadian economy, nor consistent with our assumptions about primary and service industries;
- (h) the estimate of the average number of days closed weights each firm in our sample identically. The number of days closed may in fact vary with the size of the firm. If, for instance, large firms remained closed longer than small firms, they should be weighted more heavily in the average. As well, this average is subject to sampling error. As noted below, manufacturing and wholesale firms appear to be under-represented in the sample, relative to retail service firms.

The direction of the bias introduced by points (f), (g), and (h) is unknown. Points (a), (b), and (c) are likely to lead to an overestimate; that is, they call for the estimate to be scaled downwards relative to average daily production figures. Points (d) and (e) are likely to lead to



an underestimate, and would call for an upward adjustment of the estimate of lost production. Overall the direction of the bias cannot be predicted a priori, though the fact that some sources of error will offset other sources to some unknown extent allows one to have more confidence in using our calculations as rough estimates of the likely production losses.

Although these calculations are indeed rough guides to the production losses, the analysis still provides some information on the orders-of-magnitude involved. Thus it is safe to say that the value of lost production in Mississauga was in the tens of millions of dollars, rather than in the hundreds of millions or hundreds of thousands of dollars.

#### 7.5.4. A framework for analysing the impact on business profits

Even if it is not practical to generate an estimate of the overall reduction in profits due to the closing of business, it is possible to make some tentative observations about the harm done to the business sector. Some insight into the problem can be gained merely by considering the various possibilities that arise.

Consider a hypothetical firm that produces and sells its goods at a constant rate through time, and that can stop and start up its production without additional costs. If all firms were like this, calculating profits lost by firms fully closed down by the Mississauga emergency would be simple. For each firm, the daily reduction in profit could be estimated from its daily profit under normal circumstances, which could be obtained from annual accounting statements for earlier years, with appropriate adjustments analogous to those applied in our calculation of daily

net-value added. The total reduction in the profit of a firm would be the daily profit times the number of days it was closed.

Since these hypothetical assumptions do not hold, it is useful to ask what can be said in general about the effects of more realistic assumptions. To do that it is helpful to consider the revenue and cost components of profit separately. Both will be affected by a closing, but, in most cases, differently. In theory, a firm that has experienced an unplanned interruption in its business can find that its annual total costs have risen, fallen, or remained constant; that its annual total revenue has risen, fallen or remained constant; and that each has changed to a different extent. Combining changes in cost and revenue indicates that its profit may have changed in either direction or may have remained constant.

In practice, all of the possible changes are not equally likely. A typical firm is likely to find that sales revenue has fallen or remained constant, the latter occurring because the nature of the firm's product is such that a brief interruption has no effect on sales or because lost sales are made up after reopening. An increase in revenue is possible. For example, a firm that supplies special services during the evacuation on an emergency basis may permanently gain new customers as a result. But, since this will occur very infrequently, for this analysis it will be assumed that it is not a possibility.

In regard to cost, both increases and decreases are likely outcomes. Decreases can occur when a firm that stops production is able to curtail purchases of materials and labour. Increases can occur because of extra costs due to inventory spoilage, special expenses related to starting and stopping production, overtime pay after reopening, and so on.

If these special costs are matched with no change or a smaller reduction in normal labour and material expenses, total annual cost outlays will rise.

Nevertheless, the possible outcomes in regard to cost can still be narrowed. In the case where a firm's costs fall, it can be safely assumed that they will fall less than proportionally to the fall in production or, typically, to the number of days closed. Even for a period much longer than a week, a significant portion of firm's cost is fixed. One can be virtually certain that a portion, even a large portion, of a firm's expenses will not be avoidable for a closed-down period as short as a week or less.

In the light of these considerations, the following possible outcomes are treated in our analysis.

In regard to revenue:

(1) annual revenue will be unaffected (because no sales are lost or because any lost sales are fully made up after reopening);

(2) annual revenue will fall, but by less than in proportion of the number of days closed (because some but not all lost business is made up); or

(3) annual revenue will fall fully in proportion, or more, to the number of days closed.

In regard to cost:

(a) annual cost remains constant;

(b) annual cost rises because of special expenses; or

(c) annual cost falls, but less than proportionally to the number of days closed.

In order to see more clearly the effects on profit of these various changes in cost and revenue, they are set out in matrix form in Table 7.16. In each cell the change in profit due to the combination of the corresponding revenue

The Possible Effects on Profit Due to a Sudden Interruption of Business According to Various Behaviors of Annual Cost and Annual Revenue

Cost Revenue	Cost Constant	Cost Rises	Cost Falls, but less than in proportion to days closed
Revenue Constant	A → no change in profit	B → profit falls by increase in cost	C ↗ profit rises by reduction in cost
Revenue falls, but less than in pro- portion to days closed	D ↗ profit falls by reduction in revenue	E ↓ profit falls by sum of cost in- crease and re- venue reduction	F ↗ profit falls or rises according to rela- tive magnitudes of revenue and cost re- ductions
Revenue falls in proportion to days closed or more	G ↗ profit falls by reduction in revenue	H ↓ profit falls by sum of cost in- crease and re- venue reduction	I ↗ profit falls by dif- ference between revenue reduction and cost reduction

N.B. The arrows indicate the direction of change in profit corresponding to each cell. The arrows in cell E and H are drawn vertically, to indicate that they represent worse outcomes for a given firm than cells in which only one component of profit has changed adversely. In general, the arrows can be compared across some cells but not across others. For example, for a given decrease in revenue, a firm is worse off in cell E than in cell D, or in cell H than in cell G. However, whether cell B is worse or better than cell D depends simply on the specific magnitudes involved and a general inference is not possible.

and cost changes is noted. For instance, if an increase in cost is combined with a decrease in revenue, the firm's profit will fall by the sum of the two changes, as noted in cell E and cell H. It can also be concluded that, for a given firm, cell H involves a larger reduction in profit than cell E. To allow easier reading of the table, an arrow is shown in each cell to indicate the direction of the change in profit. In the next section some survey data are presented in similar matrices and the arrows then serve as reminders in those tables.

Even when some effects on revenue and cost are eliminated from consideration, the impact of a sudden closing can still have the full range of possible effects on profits. Profit may be unaffected; it may fall; or it may rise.

#### 7.5.5. An analysis of the impact on business profits

Information regarding the behavior of cost and revenue in response to the business closing was obtained by mailing the questionnaire shown in Appendix 2 to a random sample of firms in the evacuation area. Usable replies were received from 154 firms. The answers to questions 4 and 5 allow these firms to be allocated to the cells defined in Table 7.16. Table 7.17 shows this allocation in percentage terms and provides an interesting profile of the distribution of the impact of the business closing.

A hypothesis that all possible outcomes are equally probable would be clearly rejected on the basis of these data. Twenty-nine percent of the firms lost some revenue; 56% (86 firms) suffered a reduction at least in proportion to the numbers of days each was closed. More than three-fifths of the sample (96 firms) reported that their annual costs neither rose nor fell; one-third reported an increase in cost; and less than 5% reported a decrease in cost.

Table 7.17

Changes in Revenue and Cost Due to the Evacuation for Sampled Firms:  
Percentage Frequencies

Total number of firms = 154

Cost \ Revenue	(a) constant	(b) rises	(c) falls less than propor- tionally	
(a) constant	A → 24.7	B ↘ 4.5	C ↗ 0	29.2
(b) falls less than propor- tionally	D ↘ 9.1	E ↓ 5.2	F → 0.6	14.9
(c) falls propor- tionally or more	G ↘ 28.6	H ↓ 23.4	I ↘ 3.9	55.8
	62.3	33.1	4.5	100

Note: The designation (a), (b), and (c) correspond to the answers to question 4 of the survey questionnaires as they apply to the rows of the above matrix and to question 5 as they apply to the columns. The arrows indicate the direction of change in profit associated with each cell. (See Table 7.16 for further explanation).



Just under one-quarter of the firms, those in cell A, were not affected by the closing. However, exactly the same number fall into cell H, which is the worst possible outcome from a given firm's point of view: cost has risen, and revenue has fallen to the greater of the two extents allowed for in the questionnaire. The most frequent outcome is G, which involves a substantial loss, but a smaller one for any given firm than would have occurred if it fell into cell H. In total, almost 75% of the firms in the sample suffered some losses, almost 25% suffered no losses and under 1% (the one firm in cell F) could either have lost or gained.

The low frequency of entries in column (c), including the complete absence of firms in cell C, is surprising. While the continuance of normal wage payments was common, it is also known that many people lost wages. Thus, one would expect a considerable number of firms to have reduced wage costs. Two explanations are plausible. First, it is possible that firms that did not pay their workers for lost time also had unusual costs, such as inventory spoilage or overtime pay that more than offset the wage savings. The second possibility is that the survey question on cost was sometimes misunderstood. A respondent may view the act of not paying an employee when he is not working as keeping cost constant (and avoiding an increase in cost) rather than as a reduction in cost. It is the latter that is consistent with the accounting framework used here. This would suggest an upward bias in column (a) as well as a downward bias in column (c).

The experience of losses due to the closing could vary systematically across different types of activity; for example, retail sales versus manufacturing. Respondents were asked to identify which category best describes their activities (question 3). Two problems arise in interpreting



the answers. First, the distinction between retail and service activities is difficult to make and often arbitrary. Into which category, for instance, would a service station for cars fall? Second, the number of respondents engaged in wholesaling and manufacturing was very small, 15 and 12 (out of the total of 154) respectively. The sample was chosen randomly out of a street directory and the problem is in part simply that a high proportion of the population of firms are in service and retailing activities. However, there is reason to believe that the 16% of our sample in manufacturing and wholesaling is lower than the actual proportion of such firms operating in Mississauga.

Inferences from the data for these two categories are consequently somewhat questionable, especially in regard to entries in individual cells of the tables. In order to reduce the impact of both of these problems, the four categories are aggregated into two: a retail-service category (denoted by R-S) and a manufacturing-wholesale category (denoted by M-W).

Table 7.18 shows the breakdown of the sample by cell into the two activity categories. In each cell the top number applies to R-S firms, the bottom number to M-W firms. In regard to inferring whether firms in one category are more probable to lose profits than firms in the other, the results are ambiguous. For example, a higher percentage of M-W firms than R-S firms maintained constant revenue during the closing. On the other hand, the R-S percentage total in column (b) is lower than the M-W percentage, meaning that M-W firms were more likely to have increased costs due to the closing. Similar ambiguities arise if individual cells are compared. However, the frequencies are not sufficiently different to warrant the conclusions that behaviour in the two categories differs (  $\chi^2 = 7.54$  with 8 d.f ).

Table 7.18

Cost and Revenue Experience of Retail-Service  
firms and Manufacturing-Wholesale firms:  
Percentage Frequencies

Number of retail-service firms = 128

Number of manufacturing-wholesale firms = 26

Cost \ Revenue	(a) constant	(b) increased	(c) decreased	
(a) constant	A → R-S: 22.7 M-W: 34.6	B ↘ 3.9 7.7	C ↗ 0 0	26.6 36.4
(b) fell less than pro- portionally	D ↘ R-S: 8.6 M-W: 11.5	E ↓ 5.5 3.8	F ↗ ↘ 0.8 0	14.8 18.2
(c) fell pro- portionally or more	G ↘ R-S: 32.0 M-W: 11.5	H ↓ 21.9 30.8	I ↘ 4.7 0	58.6 45.5
	R-S: 63.3 M-W: 57.7	31.3 42.3	5.5 0	100 100

A small store owner.....

For the operator of a variety store very near the scene of the accident, the experience of the emergency began dramatically. He was preparing to close the store when the first explosion occurred and, despite having taken shelter in a ditch, felt the heat of the second explosion. The owners of other small retail stores may not have had to run for their safety but the impact on their businesses was probably not very different.

This store lost an estimated \$7,000 in gross revenue. When spoiled inventory and other special expenses are added, the total gross loss was in the neighbourhood of \$10,000. Suppliers who normally replace spoiled merchandise would not take responsibility for spoiled milk, bread, cheese, and meat in this case. Another "perishable" good of note was lottery tickets that could not be sold by the date of the draw.

The store had no insurance coverage for such losses, and at the time of this interview, had not filed a claim in the courts, though some hope was expressed that a claim could eventually be filed once others had set precedents.

After re-opening, the store still had some difficulty due to the emergency. Its cash inflow had stopped for a week, but there were still bills to pay and re-stocking to be done. Extended credit was not automatically obtainable.

This businessman expressed some bitterness about the aftermath of the closing. He felt it was longer than necessary, that help promised by government officials was not forthcoming, and that the various inquiries into the accident were too reticent about laying blame.



That is, the experience of retail-service firms and manufacturing-wholesale firms cannot be distinguished on the basis of the answers to questions 2 and 4.

As a further experiment, the attributes of two categories of firms were set out: those that would be expected to have a high potential for loss in the event of an interruption (referred to below as HL firms), and those that would be expected to have a low potential for loss (LL firms). Each questionnaire returned was then classified into one of these categories on the basis of the answers given to questions 2 and 3. The attributes used for this classification were as set out in Table 7.19.

Clearly there is much overlap across these attributes. To develop and apply them more finely, it would be necessary to design a far more complex questionnaire. On the basis of our simple questions it is possible to assign confidently only some firms in the sample. For instance, restaurants are clearly HL firms; similarly, retail clothing stores were classified as HL, because they are assumed to depend significantly on customers in their local areas. Customers could have made purchases outside the area during the evacuation period, and also could have returned home with reduced amounts of income available for discretionary purchases. An example of an ambiguous case is that of physicians. They can easily have both HL and LL attributes. They were classified as HL in this exercise, as were dentists, construction and contracting firms, and plumbers. Hardware and furniture stores were classified as LL. In total there were 85 HL firms and 69 LL firms.

Table 20 shows the replies to questions 4 and 5 broken down by HL and LL firms. There is some evidence in support of the a priori classification. This can be seen clearly by examining the first row of the table: the percentage of LL firms

TABLE 7.19

Characteristics of Firms with High and Low Loss PotentialsAttributes of a Firm with High Loss Potential

- produces goods or services that are purchased on a quasi-continuous basis
- holds inventories of perishable goods
- produces goods that cannot be easily and cheaply held in large inventories
- sells its product outside the closed-down area and has many competitors outside the area
- supplies intermediate and consumer goods to firms and households located within the evacuated area
- its revenues depend on continual efforts to find new customers
- produces a service, especially one that is paid for per unit time (e.g., on an hourly basis)
- normally has little excess capacity in mid-November

Attributes of a Firm with Low Loss Potential

- produces tangible commodities that are not perishable
- deliveries of its product are normally made at widely-separated and flexible points in time
- its product can be held in large inventories and deliveries can be easily postponed
- produces durable goods
- sells its product outside the closed-down area and has few competitors located outside the closed-down area
- tends to enter sales contracts
- normally has some excess capacity in mid-November

Table 7.20

Cost and Revenue Experience of Firms in Two Categories:  
 Those with a High Probability of Loss (HL)  
 and those with a Low Probability of Loss (LL)

Number of HL firms = 85  
 Number of LL firms = 69

Cost \ Revenue	(a) Constant	(b) Increased	(c) Decreased	
(a) constant	A → HL:16.5 LL:34.8	B ↘ 3.5 5.8	C ↗ 0 0	20.0 40.6
(b) falls less than proportionally	D ↘ HL: 8.2 LL:10.1	E ↓ 7.1 2.9	F ↗↘ 1.2 0	16.5 13.0
(c) falls proportionally or more	G ↘ HL:36.5 LL:18.8	H ↓ 23.5 23.2	I ↘ 3.5 4.3	63.5 46.4
	HL:61.2 LL:63.8	34.1 31.9	4.7 4.3	100 100



that experienced no change in revenue is more than twice the percentage of HL firms. While 64% of the HL firms lost revenues at least in proportion to the days closed, 46% of the LL firms fell into this category. Cells A and G show striking differences in the hypothesized direction. These cells together contain just over half of the firms in each of the HL and LL categories. On the other hand, cell H casts some question on the hypothesis, since it refers to the outcome involving the largest loss, contains almost one-quarter of the firms, but shows approximately equal entries. Moreover, the column totals indicate that there is little difference between the HL and LL categories in regard to cost. For example, 61% and 64% of the firms in each category experienced no change in cost.

The null hypothesis that there is no overall significant difference between the HL and LL frequency distributions, on a cell-by-cell comparison, was used to calculate a Chi-square statistic. It is 11.97, which does not allow rejection of the hypothesis at either the 5% or 10% levels of significance. The hypothesis that the row totals do not differ significantly leads to a Chi-Square statistic of 7.75 with 2 degrees of freedom. This allows rejection of the hypothesis at the 2.5% level. For the column totals the Chi-square statistic is 0.11, which does not allow the null hypothesis to be rejected.

Thus one can conclude that the classification scheme used here makes it possible to distinguish in rough terms the type of firm that is likely to be hurt by a sudden closing from the type that is not likely to be affected. But such a a priori distinction is effective only in regard to revenue changes. The classification scheme would have to be developed further if it is to be effective in regard to effects on cost.

Finally, it seems possible that the probability of a firm being harmed by an emergency closing would increase with the duration of the closing. To see whether this holds true, the firms in the sample were classified by the number of days each was closed. To simplify the discussion, tables showing this classification fully cross-tabulated by the combined effects on revenue and cost, as in Tables 7.15-7.18, are not presented here. Instead the effects on revenue and cost are considered separately in Tables 7.21 and 7.22.

In Table 7.21 the effect of the duration of the closing on revenue is shown. The likelihood that a firm experienced a decline in revenue increases with the number of days closed. For example, of the 32 firms that reported being closed for 2 days, 14 (44%) of them lost no revenue, while the remaining 18 reported that revenue fell. Of the 35 firms that reported closing for 5 days, only 5 (14%) reported no effect on revenue, while 30 reported that revenue fell.

In Table 7.22 a similar analysis of change in cost is presented. Again clear patterns are evident. The percentage of firms reporting no change in cost (column (3)) decreased monotonically as the duration increases. Since the total number of firms reporting a decrease in cost was very small (only 7 of 154), this pattern is combined with an increasing percentage of firms that suffered cost increases due to the closing (column (4)).

In sum, on both the revenue and cost sides, the likelihood of a firm's profit being reduced appears to increase as the duration of the closing increases. Tables 7.21 and 7.22 suggest, however, that the effect of a longer closing is greater in regard to falling revenue than rising cost. This

Table 7.21

Effects on Revenue for all Firms Classified  
by the Number of Days Closed

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Number of Days Closed	Number of firms	Percentage of firms in column (2) for which revenue was	
		<u>Constant</u> (3)	<u>Decreased</u> (4)
(1)	(2)		
1 or less	9	89	11
2	32	44	56
3	42	29	71
4	11	27	73
5	35	14	86
more than 5	<u>25</u>	12	88
	154		

N.B. Percentages may not add across to 100% due to rounding.

Table 7.22

Effects on Cost for all Firms Classified  
by the Number of Days Closed

Number of Days Closed	Number of Firms	Percentage of firms in column (2) for which cost was:		
		<u>Constant</u>	<u>Increased</u>	<u>Decreased</u>
(1)	(2)	(3)	(4)	(5)
1 or less	9	89	11	0
2	32	75	22	3
3	42	69	29	2
4	11	64	27	9
5	35	54	37	9
more than 5	25	40	56	4
	<hr/> 154			

N.B. Percentages may not add across to 100% due to rounding.

can be inferred by comparing column (4) of Table 7.21 with column (4) of Table 7.22. The percentage of firms showing decreased revenue rises to a higher level and more rapidly (from 11% to 88%) than does the percentage of firms showing increased cost (from 11% to 56%).

#### 7.6. CONCLUSIONS

The impact of the evacuation on Mississauga's households and businesses and on various public agencies has been considered in some detail. Where cost estimates have been presented considerable effort has been made to explain precisely to what and to whom the cost refers. For the household sector, only costs to households within the evacuation area were estimated. Costs incurred by households outside the evacuation zone which received evacuees have not been included. The business sector costs considered in the study were borne by a rather different set of people, including owners and employees who live outside of the evacuation zone but whose place of work within the zone was closed down. No attempt was made to estimate any gains to other businesses that experienced an increase in sales due to people shifting their expenditures elsewhere. Finally, the public sector costs were incurred at the municipal, regional and provincial levels, again involving many people beyond the borders of the evacuation zone.

For a number of reasons the confidence one can have in the cost estimates also varies. One is particularly aware of the difference between the household and public sector estimates on the one hand and the business sector estimates on the other. In the former cases it was possible to obtain much of the necessary data directly from participants in the evacuation. In the case of the business sector, quantitative

data sufficient to construct comparable estimates were not collected. The estimates based on the aggregate annual net production in Mississauga provide a rough guide to business losses, but they are not the same as estimates based on the actual experience of businesses during the evacuation period.

The total estimated cost considered in this study is about \$70 million dollars, as set out in Table 7.23. Because the largest component of this total is more hypothetical than its two smaller components, and because only costs incurred within the evacuated area have been focused upon, this amount should be viewed as a tentative and incomplete measure of the overall economic costs of the evacuation. Nevertheless the total and its components provide some indication of the costs borne by people who live, own businesses and work in the evacuated area and who pay taxes to the governments that financed the public sector costs.

Table 7.23Total Estimated Costs of the Mississauga Evacuation

<u>Sector</u>	<u>Source Table</u>	<u>\$ Million</u>
Household <sup>1</sup>	7.2, 7.3, 7.5, 7.6	\$16.5
Public <sup>2</sup>	7.13, 7.14, 7.15	2.0
Business	7.16	50.2
Total		\$68.7

1. Income losses of \$ 8 million are excluded. These are included in the business sector costs based on decline in value added.
2. Direct damages to City of Mississauga buildings are excluded since these are not attributable to the evacuation per se.



## **Chapter 8**

### **COPING WITH RISKS**



### 8.1. THE INCREMENTAL SAFETY APPROACH

The Mississauga evacuation brought to public attention the fact that every day many communities are exposed to the risk of a disaster due to the transportation of hazardous materials. Questions therefore arise about how society handles the problem of such risk and what degree of protection is provided for innocent victims of the accidents which may happen. The transportation of hazardous materials is but one part of a growing public concern with a wide range of risks to which people are involuntarily being exposed as a result of the advance of technology, the growth of industry and the concentration of population in areas where accidents are likely to occur (Whyte and Burton, 1980).

Western industrial societies, Canada included, are in a transition process with regard to dealing with risk. The now traditional approach can be labelled the "incremental safety" method. The new approach can be labelled "risk assessment or risk analysis". The "incremental safety" approach simply requires that levels of safety are monitored by experience and are improved usually in small steps when found wanting. This approach has dominated the thinking in the rail transport industry, at least until very recently.

The rationale for the "incremental safety" approach is that safety is in everyone's interest and that the companies responsible for the transport of dangerous materials will therefore act in their own interest by operating in a safe manner. This involves applying the best practicable technology in the design of tank cars and railway tracks and exercising reasonable care in the testing of operational procedures and safety inspections. It also involves following government specifications and regulations where these apply.

This approach also relies on the self-correcting method of experience. From time to time accidents occur, and where these are judged to indicate a serious doubt as to the level of safety which exists, an official enquiry is indicated. In the Mississauga case an inquiry was conducted by Mr. Justice Grange whose report (Grange, 1980) recommended a number of changes in railway inspection of equipment designed to increase safety. These recommendations are now the subject of further examination before the Railway Safety Committee of the Canadian Transport Commission. The evaluation of the Grange recommendations depends on an assessment of the risks and benefits of transporting chlorine by rail.

What is being challenged in the CTC hearings (underway at the time of writing) is the traditional "incremental safety" method or approach. The argument, stated implicitly and not in these terms, is that the level of risk may have increased through the creation of a new class of risk not readily susceptible to learning by experience. These are the low probability - high consequence risks (LOPHIC) - the sort of event that is extremely unlikely to happen, but which can happen, and if and when it does, is likely to have extremely serious consequences indeed.

The "classical" risk of this kind which has been much discussed and analysed is the possibility of an accident at a nuclear power station resulting in a massive release of radioactivity into the surrounding environment (U.S. NRC, 1974). It now seems possible that similar LOPHIC accidents could also occur in the transportation field. The main accident of this kind that has been identified is the BLEVE (boiling liquid expanding vapor explosion) that could conceivably result from damage to an ocean-going tanker carrying liquified natural gas (LNG). The Mississauga accident is a reminder that LOPHIC events can also occur in various modes of inland transportation.

## 8.2. RISK ANALYSIS

As an aid to rational decision making about safety the method that is being developed to study and assess such possibilities is called risk analysis. Risk analysis was first developed as a formal quantitative method in the aerospace industry, specifically in the NASA programme. It was subsequently applied to the nuclear industry, most notably in the Rasmussen report on accidents at nuclear generating stations. The method is now being extended to a wide range of technological systems in many different countries. The procedure of risk analysis is essentially to model a sequence of events (contingent probabilities) that can lead to an accident, and then to assess the consequences of an accident. The average annual expectation of loss or damage can then be calculated by multiplying the consequences by the probability.

In order to carry out an assessment of the risks of transporting chlorine by rail, a model of the relevant parts of the transportation system is required as well as information on the properties of chlorine and the behaviour and distribution of people involved. This is the "risk system" and defining its components and interactions is a major research task.

From data such as the total volume of chlorine shipped by rail; the size of shipments; distance travelled and accident rates, it is possible to estimate the probability that tank cars carrying chlorine will be involved in an accident. Further information on design specifications of tank cars and the type of damage incurred in accidents is needed to estimate the likelihood that a chlorine release will occur.

If it is postulated that chlorine is released either in a steady stream or sudden burst, the risk analysis will have to consider models of atmospheric dispersion and dose/response models for estimating health effects.

The risk analysis is thus developed using a fault tree analysis in which a number of sequential events are postulated and contingent probabilities are attached to each one.

Batelle (1980) have undertaken a risk analysis for chlorine transportation by rail in the U.S.A. They estimated that:

- a) the probability that a chlorine release will occur is  $1.9 \times 10^{-4}$  per shipment;
- b) the number of chlorine tank car trains involved in accidents in 1985 will be 150;
- c) 1.8 of these accidents will result in a serious release of chlorine
- d) the expected number of fatalities from chlorine releases in 1985 is 9.4.

Thus, for the average American, the chance of being killed in a tornado is ten times greater than being killed by a chlorine gas leak from a rail car accident (1 in 2,3000 compared to 1 in 22.3 million persons).

A comparison of the Batelle study with other risk analyses for chlorine transportation shows a considerable range in the estimates for risk of death per ton/mile of liquid chlorine transported (Table 8-1). The final figures yielded by such analyses are orders of magnitudes only, despite the fact that the input data requirements are very high, and are not even generally available for Canada.

A comparison of the estimates in Table 8-1 with accident experience shows that the risk analyses predict a greater incidence of chlorine release and public fatalities than have actually occurred. Indeed the historical frequency of

minor releases is about 80% less than predicted; for significant releases, it is about 20% less than predicted; and fatalities predicted are about 10 times the historical levels for the period 1976-78 (86 predicted deaths versus 9 actual; of which 8 were in 1978).

The Batelle study identifies a total of 103 possible release sequences, but these do not appear to include the one that occurred in Mississauga.

The Batelle study is concerned with the frequency distribution of all accidents and does not address itself to the maximum credible accident. As noted elsewhere in this report, the Mississauga accident is notable for its lucky circumstances. The risk analysis carried out by Batelle nowhere suggests the possibility of consequences of the magnitude which we know could have occurred had the circumstances (location, timing, manner of chlorine release) of the Mississauga accident been different.

Furthermore the Batelle and other risk analyses of transportation of chlorine are concerned with accident probabilities and probable deaths. In the case of Mississauga the major consequences were in the economic and social costs of disruption. None of these significant economic and social costs that actually occurred are included in the formal assessments of the risks. The Batelle study does not estimate the costs of risk reduction methods to see whether they are justifiable in terms of expected reduction in fatalities nor does it indicate how deaths might be reduced by means other than technical changes - means such as higher inspection and maintenance standards or more effective emergency planning.

It is clear from these comparisons of the predictions of risk analysis and an actual event, that there are major shortcomings to what risk analysis can do and has done so far.



Table 8.1 Comparison of estimates for risk of death from transportation of chlorine

Report	Country	Deaths per ton/mile of liquid chlorine transported
Lautkasi and Mankamo, 1976	Finland	$5.9 \times 10^{-8}$
Simmons, Erdmann and Naft, 1974	U.S.A.	$1.5 \times 10^{-8}$
Batelle, Memorial Institute, 1980	U.S.A.	$6.8 \times 10^{-9}$
Westbrook, 1974	U.K.	$2.5 \times 10^{-10}$
		1 ton/mile = 1464 kg/km

Part of these shortcomings are a result of the heroic simplifying assumptions that have to be made, particularly relating to human behaviour and demographic data. At the same time, such risk analyses are expensive to undertake and even more expensive in the data collection they require.

Indeed, one reason why such a risk analysis has not yet been done for Canada is that the prime emphasis at present is to set up a reliable data base system. It may take some years (and considerable expense) before a full analysis is possible. The Risk Analysis Section, Dangerous Goods Branch Transport Canada is now working on the design of an accident reporting data system.

Despite the present shortcomings of risk analysis the case seems clear that knowledge of the probability of accidents and the possible consequences has now become recognized as an essential basis for decision-making about railway safety as well as for other technological systems. Canada is proceeding relatively slowly in this area and probably should move more rapidly. This leaves open the question of

who should be responsible for carrying out risk assessments and at whose expense. The mood in industry and in government is not characterized by great enthusiasm for risk assessment. It generally seems to be regarded with caution as a new analytical tool. Caution in the use of risk analysis would seem to be justified.

### 8.3. A STRATEGY FOR RISK MANAGEMENT

Given that risk analysis does not in any case by itself reduce risks, how is society proceeding with respect to the protection of the public especially from LOPHIC risks?

Three objectives can be distinguished: to reduce the risks; to optimize risks against benefits; and to mitigate the consequences of accidents (Table 8.2). The first objective assumes that risks can be progressively reduced by learning from experience. Incremental improvements in safety are achieved through mechanisms like the Grange Enquiry and Railway Safety Committee hearings, leading to new regulations. Public concern and public pressure play a role in this process as exemplified by the Metro Toronto Residents' Action Committee' (M-TRAC 1981) brief to the Committee. This approach works well with many types of risk but is open to question for LOPHIC risks, where experience is not a satisfactory guide.

The second objective assumes that the problem is not necessarily to reduce risks (they may be low enough already) but to achieve an optimal solution by balancing risks against benefits. According to this view, it makes no sense to spend large amounts of money reducing risks if such costs will, in effect, reduce the benefits by a greater amount than

Table 8.2. Strategies for risk management

Objective	Method of Approach
1. Risk Reduction	incremental safety and response pressure
2. Risk Optimizing	introduction of risk analysis, risk-benefit calculations
3. Consequence Mitigation	improve emergency planning, compensation and insurance

the expected increase in safety. The introduction of risk analysis and risk-benefit calculations is a response to this objective.

The third objective is simply to find ways of mitigating the consequences of accidents should they occur. The first approach is through the improvement of emergency planning and various steps are now in progress in Ontario to achieve this. A second approach is through the payment of compensation for damage to injured parties and the purchase of insurance to make sure that funds are available for this purpose without bankrupting or severely affecting those who might be judged to be liable.

#### 8.4. INSURANCE

Companies involved in business that can result in substantial liability often resort to insurance to protect themselves against major claims. However, this is not a universal practice. Some companies prefer to be entirely "self-insured", that is, they pay no insurance premiums and

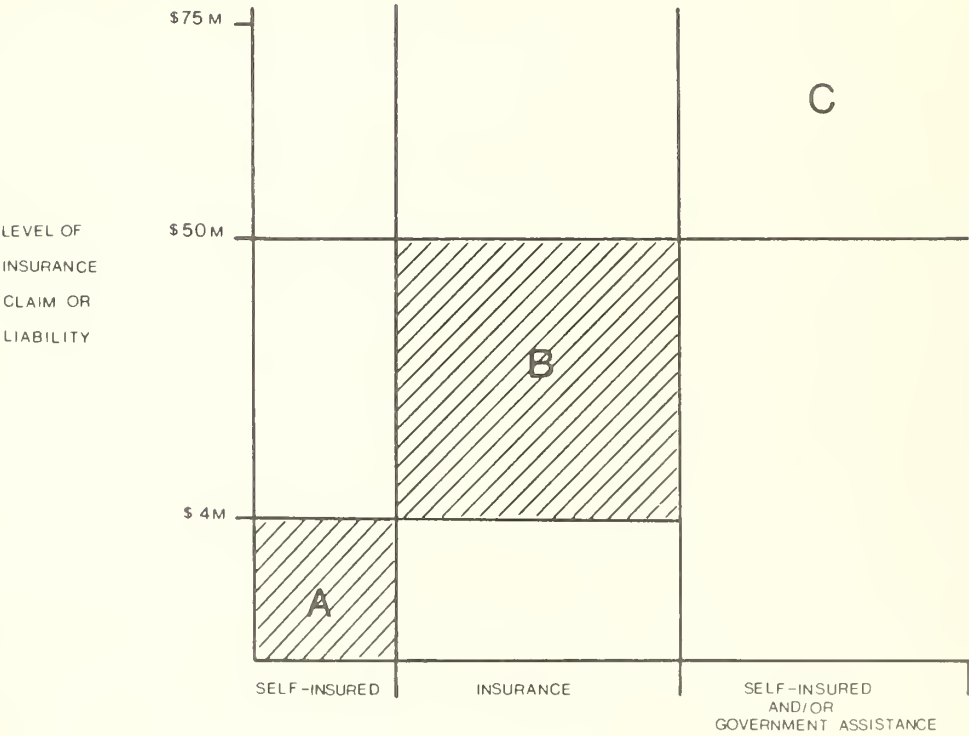
expect, if the worst comes to the worst, to pay out of their own funds.

A more typical case is shown in Figure 8-1. Here a company accepts responsibility for claims or liability up to a certain level - say \$4 million. This is, in effect, a deductible clause that protects the insurance company from frequent small claims. A large area of liability (from \$4 million to \$50 million in Figure 8-1) is then covered by insurance for which the insured party pays a premium. Usually one insurance company does not accept the whole "package" of insurance itself, but makes reinsurance arrangements with other companies to spread the risk.

The insurance company imposes an upper limit on the amount of coverage. Usually this is not based on any analysis of the probability of claims being made at that level. The insurance industry recognizes the unreliability of estimates of the probability of low frequency events and these are not used in decision-making. The upper limit to insurance is usually based on a number of quite extraneous factors such as the amount of money available for investment in insurance; the anticipated rate of return in the investment market; the reputation and loss-history of the corporation in question as well as the loss-history of other corporations engaged in similar activities. The insurance industry approach, therefore, is not dissimilar to the approach of "incremental safety". It relies on experience.

Experience is less useful for low probability situations, especially where there can be high consequence risks. The upper limit on coverage excludes such risks from consideration. When a LOPHIC event occurs one of three things can happen: the company pays up and suffers a major loss, the company cannot pay up and those who suffer damages receive no

FIGURE 8.1  
EXAMPLE TO SHOW HOW A COMPANY  
HANDLES ITS LIABILITY INSURANCE



compensation, or less than the full amount of damages; government intervenes to provide compensation (either because it does not wish to see a company collapse or because of political demands that help be given to those who have suffered loss.)

This means that in some industries new risks may be in the process of being created by the enlarged scale of operations, which private companies have no hope of being able to cover from insurance or from assets. Implicitly, the risks are being thrown on government or the whole society to accept. This is another reason for risk analysis - to provide some information on the level of risk that private corporations (and Crown Corporations) are implicitly asking the society at large to take, and to bear the consequences.

#### 8.5. THE PAYMENT OF COMPENSATION BY CP RAIL

In the normal course of events people who suffer damage to their property, their health or through the disruption of their business or enjoyment of their homes, can sue whomsoever they consider to be liable for such damages in a court of law. The tort system can be used to recover damages provided that the court agrees on the question of liability. The tort system can be extremely slow, however, as well as costly in contested cases. For these reasons, damaged parties are discouraged from filing suit when the damage is relatively small and when the matter of liability is difficult to establish.

The slowness of the tort system can impose particular hardship on individuals or families who are evacuated as a result of accidents of the kind that occurred in Mississauga.

It has become the practice of many private companies to establish compensation programmes to reimburse evacuees for the out-of-pocket expense incurred during an evacuation. Government agencies often make similar arrangements during evacuations due to natural disasters.

On Monday, November 12, 1979 while the evacuation of Mississauga was still in progress, CP Rail announced that it would, as a gesture of goodwill and without admitting liability, pay the out-of-pocket expenses of Peel region residents who were advised to evacuate. In a fuller statement on Tuesday, November 13, CP Rail spokesman Stephen Morris said that claimants would be asked to sign a receipt for their expenses, and that this would not prevent them from seeking compensation for building damage or lost wages if the Company was later found liable for the emergency. This initial position was rapidly changed the following day (November 14) when a fuller statement was made that CP Rail would require people to sign releases from further claims before receiving payment.

On Monday, November 19, one week after the accident, CP Rail opened its claims office at Square One in Mississauga where it had 26 claims agents on hand to look after those seeking compensation for their out-of-pocket expenses. A copy of the claim form is shown in Figure 8.2. There were long lineups during the first couple of weeks so that on December 1 CP Rail announced that it would start an appointment plan for claims. On the first day when some 1500 claims were processed, CP Rail agents are reported to have been generous in what they allowed evacuees to list in the category of "other" expenses and what exclusions they could write into the waiver clause. Many wrote in exclusions like wage losses and future health and property expenses. By Tuesday, November 20, the agents were taking a more restrictive view and claimants were allowed to exclude only



FIGURE 8.2

8-13



# CLAIM REPORT FOR OUT OF POCKET EXPENSES

Please Print or Type

NAME:

MR MRS MISS MS

Initials

1 2

Last name

ADDRESS:

Street

City

Postal Code

SOCIAL INSURANCE NO:

BIRTH DATE:

Day Month Year

DRIVER'S LICENCE NO:

OTHER MEMBERS OF FAMILY INCLUDED IN THIS CLAIM:

Initials

1 2

Last name

Relationship

attach separate list where necessary

OUT OF POCKET EXPENSES INCURRED (ATTACH RECEIPTS WHERE AVAILABLE)

DESCRIPTION				AMOUNT CLAIMED	FOR OFFICE USE ONLY
Hotel Accommodation:	Hotel	No. Nights		\$	
Meals Purchased:	Sun 11/11/79	No. Meals		\$	
	Mon 12/11/79	No. Meals		\$	
	Tues 13/11/79	No. Meals		\$	
	Wed 14/11/79	No. Meals		\$	
	Thur 15/11/79	No. Meals		\$	
	Fri 16/11/79	No. Meals		\$	
OTHER (provide description):				\$	
attach separate list where necessary					
TOTAL AMOUNT CLAIMED:				\$	

PAYMENT OF THIS CLAIM IS NOT AN ADMISSION OF LIABILITY

HAVE YOU INCLUDED:

- Name, Address, Telephone Number
- Social Insurance Number
- Birth Date
- Other Family Members Included In Claim
- Details Of The Claim
- All Available Receipts

UPON COMPLETION, PLEASE MAIL TO:

CP Rail Emergency Claims Office  
Suite 930  
40 University Avenue  
Toronto, Ontario  
M5J 1T1

I release all claims against Canadian Pacific Limited in any way connected with the derailment of CP Train #54, at Mississauga at approximately midnight between November 10th and November 11th, 1979.

Dated at Mississauga this \_\_\_\_\_ day of \_\_\_\_\_ AD \_\_\_\_\_

Witness

Claimant

future wage losses from the waiver. By Wednesday, November 21, no exclusions at all were allowed.<sup>1</sup>

During this time, a dispute arose between the Ontario Attorney-General, the Honourable Roy McMurtry, and CP officials over the legitimacy of the waiver clause which read:

*I release all claims against Canadian Pacific Ltd. in any way connected with the derailment of CP Train No. 54, at Mississauga at approximately midnight between November 10 and November 11, 1979.*

Mr. McMurtry announced at Queen's Park that he was attempting to get CP Rail to either remove the waiver or to reword it. He said that CP Rail was being irresponsible in using the form. On November 20, Mr. McMurtry said that on the preceding Monday, he told Mr. W. Stinson, an executive vice-president of CP Rail, that the release form was unacceptable, and that if CP Rail insisted on using the form it should at least stamp the warning "full and final release" in red, inch-high letters. CP Rail refused, and Mr. La Fontaine, Regional Manager of Public Relations announced:

*I am advised that we are not going to change the wording.*

The only thing the company agreed to do was to reprint the form with the release in bold type.

Mr. McMurtry sent a lawyer from the Ministry of the Attorney-General to the claims office in Mississauga to make sure that the claimants knew what they were signing, and he publicly urged evacuees to consult their lawyers before signing the form. It was reported in The Globe and Mail

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<sup>1</sup>According to CP Rail, this did not reflect a change in CP policy but simply a tightening up of procedures.

that the Ministry lawyer feared that:

*although many claimants appear happy to settle for out-of-pocket expenses most of them don't realize that they may be forfeiting claims for such things as health problems.*

Mr. McMurtry felt that a simple receipt for payment should satisfy the rail company but he claimed that as Attorney - General he had no authority to require CP Rail to use any particular form. Nonetheless, he promised to protect the rights of those who signed.

CP Rail adopted a "take it or leave it" approach. Gerald La Fontaine, speaking for CP Rail said:

*We told the Ontario Government that if it was dissatisfied with the way in which CP Rail was running its emergency claims office, we would close it down and let the Government of Ontario take over reimbursing residents for out-of-pocket expenses.*

Having examined the possibility of setting up its own compensation program, and having decided that it could not likely do as good a job as CP Rail on such short notice, the Ontario Government took no further action. Premier Davis praised CP Rail for swiftly organizing the program. He told the House at Queen's Park that Ian Sinclair, Chairman of CP Rail had informed him that CP Rail does not accept responsibility for the accident. It was therefore acting on the advice of its lawyers in continuing to use the waiver form because, if it were removed, CP Rail might not be able to deny liability in future claims by the same people.

CP Rail kept its claims office open for over six months. 50,254 claims were processed either at the office or by mail, and according to CP Rail \$9,568,000.00 was paid out to evacuees.

## 8.6. PUBLIC RESPONSE TO COMPENSATION IN MISSISSAUGA

### 8.6.1. Claimants and non-claimants

Our surveys indicate that 57% of all evacuated households made a claim to CP Rail for compensation. More of the evacuees using the evacuation centres made claims (70%). About 35% of families living north of Burhamthorpe Road (and therefore beyond the official evacuated area) who evacuated tried to file claims; 17% actually managed to do so, and a few received compensation.

The reasons why people say they did not claim compensation are given in Table 8.3. The commonest reason is that the amounts of money involved were insignificant.

This is largely because many evacuees went to private homes and their costs were absorbed by many individual citizens. As has been noted elsewhere, more people can be expected to go to hotels in another evacuation because they now realize their expenses are likely to be compensated.

Twenty percent of those who decided against making a claim from CP Rail were put off by the process involved, particularly the long queues and the need to find receipts. It is likely that these people also had relatively small expenses. Ten percent felt that it was morally wrong to take money from CP Rail. They tended to see the derailment as an "accident", or an Act of God, and felt that no one should profit from it. In follow-up interviews, older people, in particular, voiced this view and expresses dismay at the greed of others. Only a few people (3%) did not make a claim because of the waiver to further claims that they were required to sign.

Table 8.3. Reasons given by those evacuees who did not claim for compensation from CP Rail

Reasons	All evacuees (N=218)	Those using centres (N=53)
No significant money loss	55	46
Compensation process bothersome	21	14
Morally wrong to take money	10	14
Claim was refused	12	16
Wanted to leave option open	3	9
	101%	100%

Table 8.4. Reasons why people felt that their claims for compensation cannot cover all the costs to them of the emergency

REASONS: it would not cover	All Evacuees (N=212 or 55% of total)	Those using Centres (N=107 or 72% of total)
all out-of-pocket expenses	29	27
lost income	26	17
exposure to danger	22	28
disruption and anxiety	20	23
property damage	1	1
other reasons	3	3
TOTAL	101%	99%

8.6.2. Claims versus costs

The average claim for all evacuees was \$157 with people in evacuation centres claiming more: \$250 on average. The average amount received was \$114 (\$170 for those who went to an Evacuation Centre). Almost half (45%) of those people who made claims, felt that the amount that they had asked for represented full compensation. However, people who had used an Evacuation centre were significantly more likely to be dissatisfied: 72% of them did not feel fully compensated (differences between the two samples significant at .001 confidence level).

The reasons why evacuees felt that their claims for compensation did not cover all the costs they incurred in the emergency are fairly evenly divided into four groups (Table 8.4.):

- a) it did not cover all their out-of-pocket expenses
- b) it did not cover lost income
- c) they were not compensated for the risks they endured,
- d) they were not compensated for the disruption to their lives and the anxiety they felt.

These reasons were equally likely to be given by people in different age groups, except that concerns about the danger and anxiety were less often mentioned by people under 40 years old. Their reasons were not related to differences in annual family income between evacuees and can be considered as representative of the many evacuees' feelings about the unfairness of the compensation awarded.

The amounts of money that evacuees felt would fully compensate them are shown in Table 7.10. The responses fell into three groups:

- a) those saying no compensation is necessary,
- b) those quoting dollar figures (mainly less than \$1000),
- c) those saying that no amount of money can compensate them.

Among those who used evacuation centres there are fewer people who want no money and more who feel that no amount can compensate them.

As a group, therefore, the people who used the evacuation centres, felt that they had more expenses, and that their lives were more disrupted and affected by the emergency. For them, the gap between their perceived need to be compensated and what they received, is larger than for other evacuees.

#### 8.6.3. Attitudes towards the compensation process and the role of government

The way in which CP Rail compensated evacuees also gave rise to some dissatisfaction. In response to an open-ended question "Do you have any comments about the way CP Rail compensated evacuees?" 45% of those evacuees replying thought that the procedure was generally fair. A further 9% thought the process "courteous" making a total of 54% of generally favourable responses. The 42% of unfavourable responses were scattered over six different complaints; generally not fair, (13%), some over compensation (8%), some under compensation (7%), process was not courteous (9%), and objections to the waiver claim (3%). This last finding is surprising. In spite of the public debate about the waiver clause that took place at the time only ten individuals out of 315 who replied to the question thought to complain about it.

There was no significant difference in these responses between those who went to Evacuation Centres and those who did not.

There was a significant difference between the users of evacuation centres and other evacuees in expressing feelings about the role the Ontario government played in relation to



compensation. The evacuees as a whole were relatively unaware of the Ontario Government role; 44% reported that they did not know about it. Those using the Evacuation Centres were more likely to be aware; only 28% said that they did not know anything about it.

The major difference in the reaction to the Ontario Government's role in compensation was that larger percentage of those using Evacuation Centres thought that the Ontario government could have done more (17% as opposed to only 7% of all evacuees). What more these evacuees thought that the provincial government might have done is not clear.

#### 8.6.4. Conclusions on compensation

Overall, the public response to the question of compensation is roughly balanced between people who are generally happy with the amounts they received and the way the process was handled; and those who are not. However, 8% of households report having lost income for which they have received (unfairly, they feel) no compensation so far, so that these people may try to claim more in the future. One other group feels that it has been unfairly treated - those living north of Burnhamthorpe Road who were prevented by road blocks from reaching their homes. They have been refused compensation because they were outside the official evacuation zone.

## **Chapter 9**

# **LEARNING FROM EXPERIENCE**



## CHAPTER 9

### LEARNING FROM EXPERIENCE

This chapter presents a summary of the main findings of the report, and identifies points at which the experience of the Mississauga emergency can provide more generally applicable lessons. Some of the conclusions reached lead to suggestions for improving the organisational response to emergencies. The detailed information obtained from public surveys also provides important data for modelling how the public will respond in an evacuation.

Many of the detailed findings are reported in the preceding chapters and are not given again here. The reader should therefore consult specific chapters of the report for additional conclusions.



9.1. ECONOMIC COSTS

In addition to the personal inconvenience and anxiety caused by the evacuation, it has been possible to identify a more tangible set of costs: the value of the lost opportunities for production and consumption that resulted from the evacuation. Estimates of these costs are summarized in Table 9.1 and further detail is given in Chapter 7.

Consumption losses suffered by households in the evacuation zone were identified by means of an extensive questionnaire survey. It was estimated that the total of such losses due to extra expenditures amounted to about \$16 million. The average household loss was about \$220. As well, many households in the evacuation zone lost income due to missed work. The average lost was \$90. Other households were not subject to this latter burden for there is evidence that many employers, whose businesses were closed down, continued to pay wages and salaries.

Analysis of the effect of the evacuation on the business sector was limited to the impact on businesses within the evacuated area. A measure of the potential loss of production due to the cessation of business activity is the average net value added, produced in Mississauga under normal conditions for a similar period. This was found to be in the neighbourhood of \$50 million, though this estimate must be viewed in the light of the qualifications which are discussed in Chapter 7.

A survey of businesses closed down by the evacuation showed that the burden of the closing varied widely. Roughly one-quarter of the firms sampled reported no effect on profits. Another 50% reported effects on their revenues and costs that imply a potentially significant reduction in profit. The likelihood of a firm's suffering profit reductions was seen

to depend on the length of time closed, and on the operating characteristics of the firms involved.

Table 9.1 Total estimated costs of the Mississauga evacuation

Sector	Source table	\$ million
Household <sup>1</sup>	7.2, 7.3, 7.5, 7.6	16.5
Public <sup>2</sup>	7.13, 7.14, 7.15	2.0
Business	7.16	50.2
Total		68.7

<sup>1</sup> *Income losses of \$8 million are excluded. These are included in the business sector costs based on decline in value added.*

<sup>2</sup> *Direct damages to City of Mississauga buildings are excluded since these are not attributable to the evacuation per se.*

Finally, public institutions were led to expend some funds that would have been saved if the emergency had not occurred. These amount to approximately \$2 million.

It is important to reiterate that much of the cost analysis presented in this study relates specifically to what occurred in Mississauga. If one were to consider the cost of the evacuation to the province as a whole, the story (and the cost estimates) would be different and more complex. Business gains outside Mississauga would be set against business losses within the city. It would also be necessary to add costs borne by friends and relatives of evacuees, and by people in adjacent areas whose work and travel were



disrupted - in short, costs borne by anyone who was in any way burdened by the evacuation. The people who live and work in Mississauga carried the brunt of the costs, but these external effects can also be expected to be considerable.

## 9.2. SOCIAL IMPACTS

The time at which the derailment occurred, the fact that no one was killed, and the ability of the evacuees to communicate with their families, their temporary hosts, and with the authorities all helped to minimize the social impacts of the accident.

The most significant short term impact was widespread concern, during and immediately after, the emergency. The majority of evacuees were seriously concerned for their own and their family's safety while the risk of chlorine gas was still present. Some people are still concerned about the possibility of similar accidents in the future and almost everyone has become more aware of the risks of the rail transportation of hazardous goods.

During the emergency, concern about the danger, and stress related to the evacuation was most severe for pregnant women and mothers with young children, and for people, such as the sick and handicapped, who needed assistance to evacuate. Thus, family and personal situations were more important factors in degree of concern than were residential locations with respect to the accident. People who lived close to the derailment site were not significantly more concerned than others. In general, women were much more prone to anxiety than were men.

Perception also played an important role in the degree of anxiety felt. For example, some evacuees who felt no concern because they perceived themselves to be far enough away from danger were, in reality, living as close as were other families.

The emergency has sensitised the evacuees to transportation accidents, so that for a time, these are regarded as more important than environmental pollution and nuclear risks. The evacuees' concern about transportation accidents is related to their perceptions that these hazards have relatively high probabilities, they are risks to the public, and they are caused by human error. Compared to the control group, the evacuees' believe that major technological accidents are more likely to occur; that is, the experience of the emergency has increased their perceptions of the probabilities of future risks.

Nearly a quarter of the evacuated households report that they have suffered longer term effects of the emergency. Many of these are health related or concern pets that were lost or died during the evacuation. Other people say that they are more nervous since the accident.

However, not all the social impacts were seen as negative ones. Immediately after the accident, evacuees mentioned the social costs more often than the benefits, but almost one year later costs and benefits were being mentioned with equal frequency. In the short term, people felt that the emergency had been a good learning experience, they had met new and old friends, and they would be compensated (Table 9.2). In the long term, they saw *benefits* in their greater awareness of the risks, their increased confidence in government, and in their keener appreciation of life.

The most common longer term effects of the emergency are similar to the short term impacts: increased nervousness combined with increased awareness of the risks of accidents.

### 9.3. PROBLEMS AND PROPOSED SOLUTIONS

In many respects, the organisational response to the Mississauga emergency was a model of good emergency planning and the successful implementation of judicial and consensual decisions of the control group. The consequences of the derailment were contained, public confidence was maintained, and the largest peacetime evacuation in North America was concluded without loss of life, and with little injury or property damage.

However, there were some organisational and communication problems, most of which were related to the management of the evacuation, rather than to the control of events at the accident site. Evaluation of these problems can provide a basis for improved emergency planning and response.

#### 9.3.1. Responsibility for technical experts on-site

The derailment also involved propane and chemicals, other than chlorine. In addition to emergency personnel, such as firefighters and police, several teams of technical experts were working at the site. As is recorded in the event reconstruction, these teams tended to work independently and sometimes at cross-purposes. One result was the much publicised "puff" of chlorine on Wednesday, November 14, which was accidentally released when firefighters were wrongly instructed by propane experts to hose around the chlorine car. The chlorine release focussed attention on an aspect of emergency response that is increasingly common in major technological accidents - the need for the Emergency Control

Table 9.2      Short and long-term social costs  
and benefits reported by evacuees  
one month and one year after the accident.

	SOCIAL COSTS % evacuees reporting		SOCIAL BENEFITS % evacuees reporting	
SHORT TERM	Inconvenience	28%	None	56%
	None	18	Met people	11
	Concern about losing income	16	Good learning experience	8
	Worry	14	Expected financial compensation	6
	Children missing school	9	Demonstrated good response	5
	Concern about home and people	9	Appreciate life	4
	Frustration	5		
LONG TERM	None	30	None	30
	Permanent effects	12	More aware	12
	More nervous	11	Greater confidence in government	9
			Appreciate life	8
			More prepared for emergencies	2

Note: Some evacuees mentioned more than one cost or benefit.

Group to understand, supervise, and ultimately to take responsibility for, the actions of technical experts.

The chlorine experts (CHLOREP team) sent by Dow Chemical Company of Canada Limited to assist at the site were subsequently strongly criticised for their failure to maintain a work-shift at the chlorine tank car, and third-party suits have been taken out against the company. Their role at the site, however, was not a statutory one and such recriminatory action could make other organisations and individuals unwilling to provide expertise on emergencies.

One possible solution is that the Emergency Control Group take responsibility for providing technical experts (from whatever sector) on-site and for integrating their work with that of emergency personnel; and that as long as the technical experts are acting according to accepted standards of professional practice, they (and their organisation) are protected from being held liable for damages caused by their involvement in the emergency response.

### 9.3.2. Co-ordination of social services

In addition to Peel Regional Social Services, many volunteer organisations and community groups were involved in meeting the needs of evacuees, such as food, shelter and nursing. This large network of agencies set up and ran 31 Evacuation Centres through which some 14,000 people passed, as well as serving the needs of other evacuees, including the sick and handicapped.

However, there was no planned structure for this inter-agency coordination and the huge voluntary response relied largely on the informal contacts of individuals. This led to internal difficulties for some organisations, and friction between agencies about their roles and responsibilities. Fortunately, the organisation problems only produced

inconsistency on the level of service, rather than any serious breakdown in social services.

There were also some communication problems between the Control Group and the organisations providing care for the evacuees. No one person or agency acted, or was appointed, as a link between the Control Group and social service organisations. These organisations were not asked for their advice before the Control Group made decisions affecting evacuees; nor were they advised, before the public were told, of decisions that they were expected to implement.

More attention needs to be paid in emergency planning to the provision of social services in an evacuation. The volunteer agencies which shoulder much of the responsibility should clearly be more closely linked to the Control Group during an emergency, and should have greater input to emergency plans. Since they undertake (unpaid) many emergency response tasks, consideration might also be given to some government support of their emergency response roles.

It is suggested that emergency plans should clearly identify one person and/or agency as responsible for assuring that necessary social services are maintained for the public (Coordinator of Emergency Social Services). This responsibility would include:

- a) alerting other agencies of an emergency;
- b) ensuring that tasks assigned to different agencies in the Emergency Plan (by prior agreement) are carried out;
- c) identifying gaps in social services and allocating resources to fill them;
- d) membership of the Control Group;
- e) coordination of information given to the public relating to social services;
- f) supervision of public inquiry system.

It is considered necessary that the person acting as Coordinator of Emergency Social Services become a member of the Control Group in order to provide the liaison needed between decisions affecting public welfare, and their implementation. Information should be passed through the Coordinator to other social service agencies before the public is told, in order to allow a planned and orderly response.

At the same time, the Coordinator will need to arrange for social service back-up, particularly for long emergencies, where volunteer involvement is over-taxed or peters out. For individual agencies to be effective on a large social services response structure, they need their own emergency response plans and internal communications systems.



### 9.3.3. Perimeter Control

The large evacuated area meant that there was a long **outer** cordon to seal off and maintain. Two problems arose in relation to the perimeter:

- a) communications between the Control Group and police officers manning road-blocks sometimes broke down, so that the officers were unaware for sometime of decisions that they were supposed to implement;
- b) there was inconsistency in decisions taken by individual officers about letting people in and keeping others out.

These inconsistencies were soon identified by more persistent members of the public who took advantage of them, to enter the restricted zone. Our interviews also revealed that police officers differed in how strongly they discouraged people from staying in their homes - some were reported to have been mildly encouraging.

Householders who lived outside the evacuation zone north of Burnhamthorpe Road particularly received inconsistent treatment at the road-blocks; some were refused access to their houses while others were let through. Part of the problem lay in officers not having been told exactly which streets in the area had been officially evacuated.

Another problem in maintaining perimeter control was that residents had better detailed knowledge of the configuration of streets and gardens than had most police officers. Residents were therefore able to enter the area undetected.

One important result of these difficulties in evacuating everyone and sealing the perimeter was that the area was never totally evacuated. In the Mississauga emergency, this problem was compounded later in the week by allowing some evacuees to return to their homes on Tuesday 13 November. Not only did the police have to make contingency plans to re-evacuate the area if a crisis developed (the chlorine tank car was still leaking), but the presence of citizens at risk inevitably influenced the decisions of those in charge.

In the case of the Mississauga emergency, it is not known how far the failure to completely clear and seal the evacuation zone affected the emergency response. The more rapid method of reducing the risk of the chlorine tank car, by introducing a large quantity of caustic solution to neutralize the chlorine, was rejected although it had been successfully used in Florida. It required a total evacuation for some kilometers.

The more general lesson to be learned is that a totally evacuated area is a very different basis for assessing risks than is an almost-cleared area.

9.3.4. Lack of warning to the public about the length of the evacuation

Many of the social costs, and some of the direct economic ones, can be traced to the failure of the authorities to warn the public that the length of the evacuation was uncertain. It is clear that initially, the Control Group was also unaware how long the emergency would last. However, not only is the overwhelming consensus of the public that, despite the uncertainties, they should have been advised to be prepared for a longer stay out of their homes, but the Peel Regional Police Force Major Emergency and Disaster Manual, (in force at the time of the derailment), specifies that:

*Serious consideration shall be given to the following, prior to the issuing of an evacuation order:*

- d) The probable period of evacuation (consult with Department of Social Services and other related agencies regarding facilities available.)*
- g) Necessary instructions to be given evacuees on such matters as clothing to carry, securing premises, etc.*

Relatively few people were evacuated immediately after the accident; for the majority of the evacuees, there was a period of several hours in which they could have adequately prepared to evacuate. A few citizens did this, on their own initiative. Many more would have done so had they been so advised by authorities. For some people the making of preparations, following an evacuation advisory, would have caused less anxiety than hours of uncertainty about whether they would be evacuated, and when it might take place.

The greatest potential social cost of inadequate advice to evacuees was to those people needing regular medication. These evacuees were placed at additional risk. They did not forget to take medications and prescriptions; like other evacuees, they did not expect to be away from home for more than a few hours. A similar problem arose for discharged hospital patients.

The experience of the Mississauga emergency suggests that in an evacuation, the public need specific advice about what to take, and what to check within their property. They should be advised to be prepared for, at least, an overnight stay away. There is no evidence that an expectation that they might be away for longer would have reduced public compliance with the evacuation. The evacuees believed themselves at risk, and would have left to avoid that risk. Better information would have simply reduced the numbers who left without pets, money, credit cards, and clothes as well as without medication.

One suggestion is to establish an 'evacuation alert' stage prior to an evacuation order. This alert could be used as an advisory for the public to be prepared to evacuate. The advisory could be accompanied by specific advice about what to take, what to do with animals, and how to secure the property. Similar alert systems are used in other countries.

#### 9.3.5. Public Health Services

The problem of being evacuated with insufficient medical supplies was compounded for some evacuees by being unable to contact their doctors. No centrally organized system was set up for linking physicians and patients, all of whom had been evacuated (although one doctor did organize an emergency communication number by the evening of Wednesday, 14 November). Doctors were also separated from their medical records and were not allowed to retrieve them.

The result was that some evacuees could not get the medical supplies that they needed, because the doctors they could contact during the evacuation had no knowledge of their medical histories and were reluctant to prescribe drugs.

It is suggested that the establishment of an Emergency Health Communications System and Clinic (EMCSC) be part of an Emergency Plan. This would allow contact between physicians and their patients, and with pharmacists. The EMCSC should have a well publicised phone number (known, and perhaps listed in telephone directories, before an emergency). It would enable the public to make requests for information and access to medical services and advice. The EMCSC should have direct contact with the Emergency Control Group to provide accurate and up-to-date information.

A second issue is whether to allow doctors to enter the evacuation zone to collect their patients' medical records. In the Mississauga emergency, doctors were refused entry to do this, but at the same time Ontario Humane Society Officers were allowed to make nearly 2,000 house visits to look after pets. The doctors' requests to gain access to their medical records might have been more rapidly agreed to if police could have dealt with one organization, such as the Ontario Medical Association, instead of many individual doctors. It is suggested that during emergency planning appropriate medical bodies are consulted about the maintenance of physicians' services to the public during an emergency evacuation.

#### 9.4.6 Evacuation Centres

The experience of housing up to 14,000 evacuees in 31 Evacuation Centres has provided valuable lessons in selecting and running Centres for emergency shelters. The agencies involved have made their own evaluations and recommendations for improvement. Our research leads to the following suggestions for emergency planning:

- a) Secondary schools, community colleges and recreation centres are most likely to house adequate facilities. Primary schools do not usually have the food service facilities needed and have furniture that is too small for adults.

A list of suitable places should be drawn up, together with appropriate telephone numbers to call, and widely distributed to all relevant agencies as part of the Emergency Plan.

b) Centres should be chosen with due allowance for the possibility that the evacuated area may be extended. This will avoid the re-evacuation of people from centres and the associated social and economic costs of the dislocation.

c) Centres should be set up before the public is informed, and evacuees start to arrive. This includes the establishment of registration, food and hygiene services, and sleeping accommodation

d) The number of evacuees accommodated should not exceed a Centre's capacity.

e) Day care workers are experienced in working with young children, and day care centres have special facilities for them. Use might be made of these services during evacuations, if they can be made available.

f) Arrangements should be made for doctors to be in attendance at Evacuation Centres in addition to Public Health Nurses and volunteers. Doctors are needed to prescribe drugs as well as to examine patients.

g) Evacuees should be involved as much as possible in helping run the Centre. This increases public morale, reduces the dependency of evacuees on others, and lightens the work burden of the volunteers and officers.

In addition, the Evacuation Centres need to be coordinated in terms of volunteer deployment, provision of services, regulations (e.g. relating to pets), and information given to evacuees. It is suggested that in the Emergency Plan, one agency should be designated to perform this coordination function for all Centres. This agency should have pre-arranged local contacts for marshalling manpower and

other resources, and would be responsible for informing the people and agencies running individual centres.

In the final analysis, it was good organization rather than better facilities or small numbers of evacuees that marked the best Evacuation Centres from the rest.

#### 9.3.7. Compensation

It has come to be accepted that people affected by disasters not of their own making, should receive compensation for at least part of their loss. Where disasters are of natural origin (floods, tornadoes, forest fires, snowstorms, etc.) it is presumed to be the governments' responsibility to help. Under the Ontario Disaster Relief Assistance Program, some \$4 million has been paid out to victims in 12 disasters in the period 1979-80.

Where man-made disasters occur, the situation is complicated by the question of liability. It is now common practice, although not mandatory, for private companies involved in emergencies to pay out-of-pocket expenses. They are careful, however, not to admit liability.

In the Mississauga evacuation, four problems of equity arose in relation to the compensation paid by C.P. Rail;

(a) Some people living just outside the perimeter of the evacuation zone were denied access to their homes once they had left for work or for other purposes, because they needed to go along Burnhamthorpe Road to reach home. They were effectively evacuated, but were denied compensation on the grounds that they were not officially evacuated;

(b) many property owners living close to the accident, who suffered property damage from the derailment, have so far received no compensation from C.P. Rail or their house insurance companies.

(c) people have received no compensation for lost income.



(d) people who stayed in private homes during the evacuation, and who contributed to household expenses were not compensated, nor were the people with whom they stayed. In contrast, people going to hotels received compensation for their rooms and meals.

Present compensation practices for losses suffered in man-made emergencies need to achieve greater fairness and consistency. The distinction between "natural" and "man-made" disasters or emergencies is itself hard to sustain in practice. The origin and course of a forest fire may have as much to do with human action as the train derailment and chlorine threat at Mississauga.

The need for a fair compensation or disaster assistance policy extending across natural and man-made emergency situations is growing and is becoming steadily more evident. The design and creation of such a policy requires careful study. It should be equitable, provide for the necessary and important role of private insurance, and should protect both government and the private sector from excessive claims. Most important of all is that a good compensation policy should encourage, and not undermine, self-reliance and local initiative in reducing risks and damages.

It is suggested that a broad look be taken at compensation practices in public and private sectors for all emergencies, both natural and man-made.

#### 9.4 PREDICTING PUBLIC RESPONSE TO EVACUATION

The large scale of the evacuation, and the detailed information obtained about the behaviour of evacuees allows some more general conclusions to be drawn about public response to evacuation orders. These data are not available for any other major peace-time evacuation and make the experience in Mississauga of international significance for evacuation planning.



The direct applicability of the findings in Mississauga to other emergencies, and to other countries, is dependent on the degree to which the following assumptions are valid elsewhere:

- (a) the hazard is airborne;
- (b) the hazard is perceived by the public to be a serious risk to human health;
- (c) the evacuation takes place between urban areas which are connected by good roads;
- (d) people are evacuated from their homes rather than from their places of work;
- (e) families are united at the time of the evacuation order;
- (f) households have access to their own cars and telephones, and to up-to-date information about the emergency;
- (g) people believe that they are evacuating for a few hours.

Where these condition do not apply elsewhere, the findings of the Mississauga study would need to be modified or may be irrelevant, for predicting evacuation behaviour.

#### 9.4.1. Preparations

Few people will prepare to leave their homes until they are given a specific evacuation order for their street despite being aware that other nearby areas are being evacuated.

#### 9.4.2. Time delays before departure

If they believe that they are at risk, and if the family is together, people can evacuate their homes rapidly. The evidence from Mississauga shows that 50% of households will leave within  $\frac{1}{2}$  hour, and 80% within one hour, of being told to evacuate.

The time delays before departure are least for those households closest to the accident and for those who are individually asked to leave by police at the door (60% left within 15 minutes). Households farther away are likely to put up more resistance and will take longer to leave.

#### 9.4.3. Reception areas and destinations

The distances and directions travelled by evacuees are mainly a function of social networks, expected time away from home, and the location of major urban reception areas. In the Mississauga evacuation, 25% of evacuees stayed within 5 kms, 60% within 10 kms, and 95% within 100 kms, of their homes.

Households will tend to head for specific destinations (mainly in private homes with friends and relations). Prior to this choice of emergency accommodation, they are likely to have had a family discussion and telephone contact with the receiving family.

#### 9.4.4. Traffic flows

The number of evacuation journeys is likely to be greater than the number of households. In the Mississauga emergency, two correction factors were found to be necessary to calculate the number of outward evacuation journeys.

These were:

- a) the average number of vehicles used by households to evacuate (=1.24 in Mississauga);
- b) the average number of journeys to reach evacuation destinations. This number is greater than one because some households are likely to move on to second and third destinations.

In the Mississauga evacuation, almost a third of the households re-evacuated as the zones were progressively

extended, and people found that they had not evacuated far enough away. The average number of outward journeys per household was 1.37.

Thus, the total number of outward evacuation journeys generated by 75,500 households was about 130,000 in the Mississauga emergency. For a given number of households, the number of outward journeys and time delay data can be used to predict the traffic flows per hour that are likely to be generated.

#### 9.4.5. Demand for Evacuation Centres

Where households have their own transportation, and can contact friends and relatives who live nearby, the demand for accommodation in Evacuation Centres is likely to be low (of the order of 5% in Mississauga).

Official accommodation in Centres is most likely to be sought by teenagers and by families in lower income categories. Old people living alone are likely to be brought to Centres by others.

#### 9.4.6. Non-compliance with evacuation orders

A certain number of households can be expected to refuse to leave their homes. Some of these people will conceal their presence from the authorities. In the Mississauga evacuations, others also openly refused to leave. The households who remained were mainly composed of older people, without very young children, in the upper socio-economic groups. Their main reasons for not evacuating were not fear of looting, but:

- (a) a personal risk assessment that the danger was insufficient to justify leaving;
- (b) a belief that they could get away in time, if the situation deteriorated.

In order to encourage such people to leave, they would have to be dissuaded from these beliefs with advice directed specifically at them.

9.4.7. Demand to re-enter zone

After people have been evacuated for two days, the demand to re-enter the evacuation zone is likely to increase rapidly, particularly when the sense of immediate danger has been lulled.

Evacuees will be persistent in trying to cross road blocks, and their detailed local knowledge of the neighbourhood will enable some of them to enter unnoticed. They will enter a restricted zone for various reasons, such as tending to animals, collecting clothes and theatre tickets, and will quickly identify times and places where officers manning road-blocks are most likely to let them through.

The Mississauga emergency demonstrated the need for dealing with large numbers of pets owned by people in urban residential areas. It is estimated that the evacuation of 75,500 households affected the welfare of some 38,5000 animals. Some of these pets were taken with the evacuees; others were left behind and necessitated their owners or Ontario Humane Society officers re-entering the evacuated area during the emergency.

It is clear that, in order to reduce the pressure on police manning the outer perimeter, the evacuation of a residential area should include explicit instructions to the public about what to do with their pets.

#### 9.4.8. Evacuation by households outside the perimeter

Just as a few people living inside the evacuation zone can be expected to refuse to leave, so can a larger number living outside the zone be expected to leave voluntarily.

These households need to be considered in predicting traffic flows, in delineating evacuation areas, and in providing precise information about which sheets along the perimeter are inside or outside the zone.

In the case of the Mississauga emergency, 60% of the households located close to the accident but to the north (away from the direction the wind was blowing) evacuated either voluntarily or because they could not return to their homes. Some were not reassured about the "safe" wind direction and others were confused about the location of the evacuation zone perimeter. While this high proportion of households outside the evacuation zone leaving their homes is probably due to the particular circumstances of the Mississauga emergency, some voluntary evacuation beyond the zone perimeters can be expected in any evacuation.

### 9.5 RISK ASSESSMENT AND EMERGENCY RESPONSE

#### 9.5.1. LOPHIC risks

The Mississauga train derailment came close to being a disaster; or a low probability-high consequence (LOPHIC) risk. With the growth on the scale of industrial operations, transportation and urban systems, the danger of LOPHIC accidents is almost certainly increasing. Even if it could be shown that the overall risk to society is not increasing but is being redistributed, there remains the need to respond to increasing public concern about LOPHIC hazards.

The traditional approach to public safety in Canada, and in many other countries, of relying on experience and incremental improvements in safety, is not adequate for LOPHIC risks because experience of them is (fortunately) rare, and the prospect of even one such disaster is unacceptable to the public. There is thus increasing demand for risk analysis in Canada of major industrial and transportation systems.

It is suggested that there is a need for a broader examination of risks in Ontario than has been previously undertaken. This will first require a review of data sources and record-keeping procedures. Risk analyses conducted in other countries for the transportation of chlorine by rail suggest that although the risk to the public is very low the potential consequences can be catastrophic.

#### 9.5.2. Responsibility for emergency response

When an emergency does occur, the best defence is clearly a well planned and executed emergency response. The management of the Mississauga train derailment and evacuation, in addition to the many "lucky" circumstances, shows what a good emergency response can achieve.

It is appropriate to ask, therefore, how the response demonstrated in Peel Region could have been achieved elsewhere in Ontario. Peel Region is recognised as being well advanced in emergency planning and response capability compared to many other parts of the Province. In general, emergency planning needs to be strengthened throughout Ontario.

It has been a general principle of emergency response policy in Ontario that emergencies are handled by the most local and on-the-spot authority capable of dealing with the situation. The first level of emergency response is

therefore the municipalities. They have emergency response services (police, firefighters, ambulance, hospitals etc.) and can best rely on cooperation between individuals and agencies who know each other already. Only when the emergency becomes too large for municipal resources, or when more than one jurisdiction is affected, do provincial or federal agencies usually become involved.

The status of emergency planning at the municipal level in Ontario is very variable; some municipalities have detailed plans, others do not; some are kept up to date, while others include useless telephone numbers and names.

It is suggested that the Province should require municipalities to develop, and maintain, adequate emergency plans.

The Mississauga emergency demonstrated the need for many different kinds of technical expertise in dealing with the derailed chemicals, expertise that is beyond the resources of a single municipality, or of one provincial ministry. It also demanded that the people in the Control Group become sufficiently familiar with the technical aspects of the derailment that they could make assessments about the risks of alternative technical solutions.

The implications for emergency planning are that technical and scientific expertise are important resources in emergency response, and should be readily available from wherever they exist - in government, the private sector, and the universities. Such experts should also be consulted in planning for emergencies and should themselves be familiar with the organisation of emergency response. In short, emergency planning in Ontario can be strengthened by:



- (a) involving more groups of people beyond the emergency services - technical experts, voluntary organisations and the public;
- (b) providing greater resources to the development of emergency plans and response capabilities.

#### 9.5.3. The declaration of emergencies

Although the municipality of Peel Region had a well worked-out Emergency Plan, it was never formally invoked during the Mississauga emergency. The Peel Regional Police Major Emergency and Disaster Plan remained the operational basis for the response, and in a formal sense, the Peel Regional Police Chief was "in-charge" of the situation. At the same time, the Solicitor-General of Ontario chaired the Emergency Operations Control Group, and created a consensus for all the key decisions taken.

Had the situation with the Control Group been different, and agreement not reached on a major command, it is unclear what the legal position would be and who would have been considered "in-charge", and by whom.

There is an urgent need to clarify the law with respect to responsibility and control in emergency situations. No amount of emergency planning can ultimately hope to anticipate, in detail, the emergency situations that will arise. Within a clear structure of responsibilities and roles, there is much to be said for retaining flexibility. The best emergency response is one which is built upon trust and confidence in government, and a cooperative attitude from all parties concerned. This is what the Mississauga emergency demonstrated in good measure.

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## **APPENDICES**



*Appendix 1*SURVEY SAMPLING DESIGN, PROCEDURES AND TESTSA1.1                    INTRODUCTION TO SURVEY

Six surveys were conducted in relation to the Mississauga derailment. (Table A1.1). Two surveys sampled evacuated households in general (one within 2 weeks of the emergency and one 9 months later). In addition, households using Evacuation Centres were sampled directly from the Centre Registrations in order to provide more information on a group that were known (from the first general household survey in November 1979) to represent only about 5% of all households. This group was of particular interest because they had experience of the officially organised shelters, and because we wanted to identify what kinds of people went to centres rather than to private homes.

The sampling procedure (see A1.2) deliberately eliminated businesses from the general samples. A separate sample of businesses was therefore selected specifically to find out about business losses during the evacuation.

Two other samples were drawn from populations outside the evacuation zone. One was of households located just north of the northern evacuation zone perimeter, but which were relatively close to the accident (Figure A1.1). The other sample was designed as a control to test the impact of the evacuation on peoples' risk preceptions and attitudes to compensation, as well as to give an indication of the communication patterns between households located inside and outside the evacuated area.

FIGURE A.1 LOCATIONS OF THE PERIMETER SAMPLE

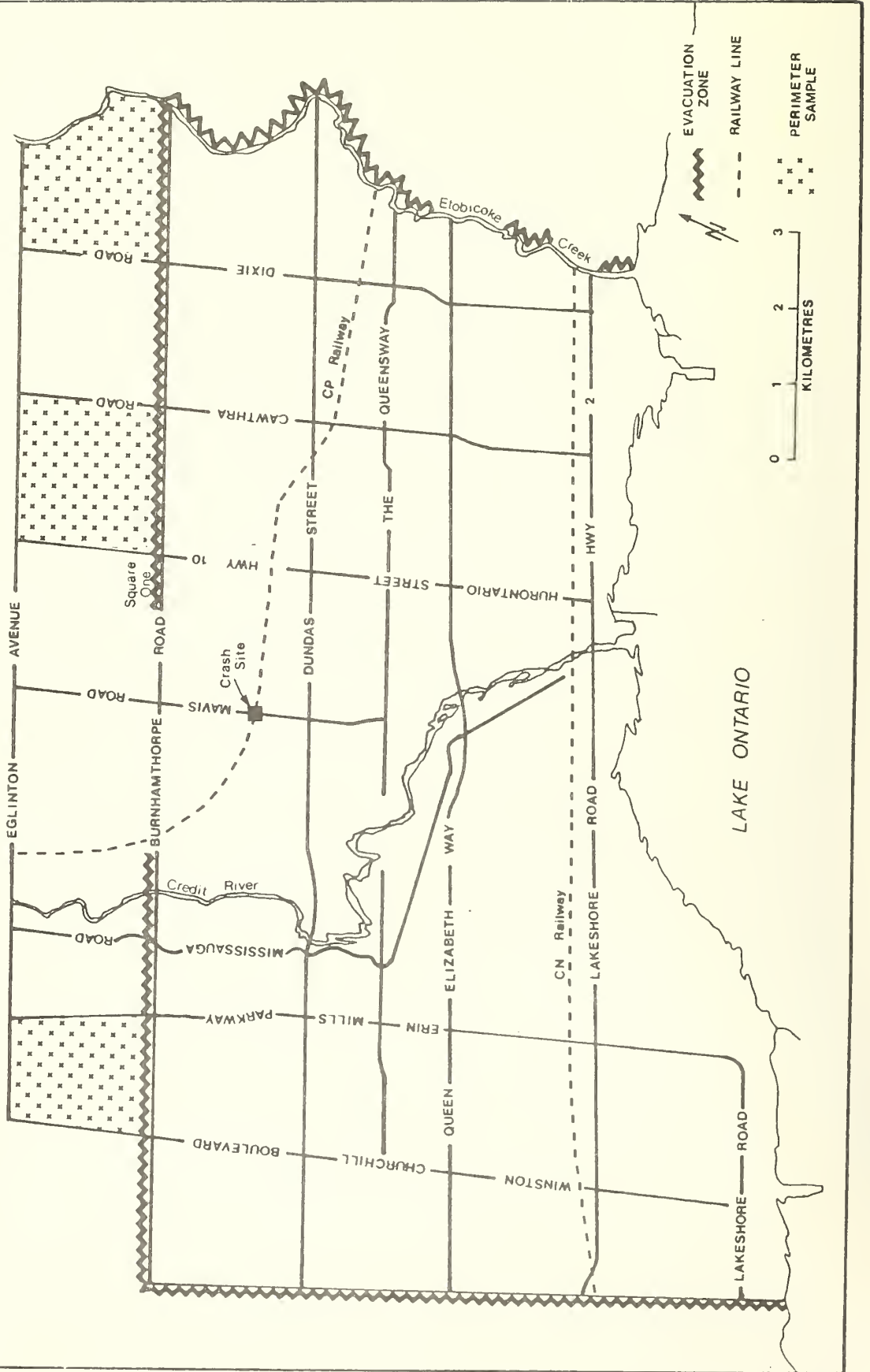


Table A1.1 Surveys conducted for the study

SAMPLE SIZE	UNIT OF OBSERVATION	TYPE OF SAMPLE	PROCEDURE	DATE
992	households in evacuation	random, stratified by zone	mailed questionnaires and telephone interviews	Nov-Dec 1979
999	households in evacuation zone	random systematic	mailed questionnaires	July 1980
500	registrations at Evacuation Centres	random systematic	mailed questionnaires	July 1980
500	households on northern perimeter	random systematic	telephone interviews	July-Aug 1980
500	households in Don Mills	random systematic	telephone interviews	July-Aug 1980
606	businesses in evacuation zone	random systematic	mailed questionnaires	1981

TABLE A1.2: SAMPLE SIZES, AND RESPONSE RATES AND CONFIDENCE LEVELS

	Main sample of evacuated households	Evacuation Centre Sample	Perimeter Sample	Control Sample
Total population (households)	75,500	3775	3000	2110
Sample size	999	501	500	510
Number of households Contacted	847	345	267	315
Questionnaires mailed again	125	n/a	n/a	n/a
Questionnaires not counted (rejected)	24	-	n/a	n/a
Completed surveys rec'd (as of Dec. 16/80)	504	175	n/a	n/a
Telephone Interviews completed	n/a	n/a	200	200
Interviews not completed (language problems or refused to participate)	67	n/a	67	115
Response Rate	45%	35%	75% a	63% a
Completed observations as % of total population	0.7%	4.6%	6.6%	9.4%
Minimum % of population for 98% confidence level (b)	0.3%	5.5%	6.6%	9.2%

## NOTES

- (a) calculated on basis of number of completed interviews divided by number of residents contacted  
n/a - not applicable  
(b) from Slonin, 1960, pp 74-75.

The questionnaires used in these six surveys are given in Appendices 2-6.

## A1.2. SAMPLING PROCEDURES

### A1.2.1 General procedure

The procedure described was used for all the surveys, with the modifications noted below.

a) The geographic area to be sampled was delineated on a map, and a list prepared of all streets located within the area.

For streets that extend beyond the delineated area, the houses located within the area were identified either by estimation or by field observation.

b) The total of observation units (usually households) was calculated from the listings in the Bower's Street Directory (1980 edition).

This directory lists all residences and businesses (separately identified) on each street that are given in Bell Canada telephone directories.

c) The desired sample size (see A.1.4) was divided into the total number of observation units (eg all households in area) to determine the frequency (eg.1 in 75 for a sample of 1000 out of 75,000 households) with which sample observations would be drawn from the lists.



d) A random number (eg between 2 and 75) was obtained from the Rand Corporation's A Million Random Digits. This number was used as the start of the sampling. Following this, a uniform interval was used to select every nth (eg 75th) observation for inclusion in the sample.

e) Special cases

1) where an observation unit had already been included in a previous sample, the unit listed immediately below was selected instead. This occurred 10 times in the selection of the second main sample of evacuated households, and not at all in the selection of the Evacuation Centre users.

2) where an ineligible unit occurred somewhere in the sampling interval, its presence was disregarded for the purposes of calculating the interval. Thus, if a desired sample interval of 75 household units included 9 non-residences, the 89th unit (75th household) was selected. This procedure was adopted because the non-residences had not been included in the original calculation of the total number of available observations.

f) Where this procedure led to undersampling (possibly because the street totals in the directory were in error), it was corrected by resampling.

#### Al.2.2 Modifications to general procedure

a) For the sample of households using Evacuation Centres, Registrations held by the Red Cross were used instead of the Bower's Street Directory. From the 800 Registrations available, a sample of 500 units was selected according to the following pattern:

RSRSSRSS (repeated)

where R stands for rejection  
and S stands for selection.

b) For the sample of businesses, the original random sample was augmented with manufacturing and wholesaling firms selected from the Yellow Pages of the local telephone directory.

### A1.3 SURVEY PROCEDURE

As shown in table A1.1, some surveys were conducted using a mailed questionnaire and others were obtained through telephone interviews.

a) The mailed questionnaires were sent, enclosing a reply-paid, addressed envelope to named heads of households, and (except for the November 1979 survey) covering letters from the Project and from Mayor Hazel McCallion of Mississauga.

b) After four weeks with no reply, a telephone reminder was made to their questionnaires. (In the case of the first survey, a short form of the questionnaire was given at this time as a telephone interview).

c) Questionnaires were mailed again (a) to households who, when telephoned, said that they had not received one; and (b) when the post-office returned them to the project as not-deliverable.

d) On receipt of the completed questionnaires, the data were coded and keypunched for computer analysis. A few questionnaires had to be rejected as incomplete.

Table A1.3 Socio-economic characteristics of the control area  
compared to Mississauga

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<u>Criteria</u>	<u>Area 520</u> <u>Mississauga</u>	<u>Area 304.03</u> <u>Don Mills</u>
Population	11,978	7,598
Population Increase (1971-1976)	319.5%	327.5%
Occupied Private Dwellings	2,140	3,270
% Owned	71%	86%
% Rented	29%	14%
Av. Number of Persons per Household	3.5	3.6
Av. Number of Persons per Family	3.6	3.6
Av. Number of Children per Family	1.6	1.6
Mobility: % Movers	75.9%	80.8%
Education (Univ. Degree)	4.6	10.6
(Grade 11-13)	18.4	16.6
Labour Force Participation		
Males	81.4%	85.7%
Females	58.6%	58.0%
Unemployment Rate		
Males	4.1%	2.9%
Females	5.0%	7.8%
Birthplace*		
Canada	70.5	69.9
Outside Canada	29.5	30.1
Family Income*		
(average total)	\$10,631	\$13,627
Average Cash Rent*	156	181
Period of Home Const.*		
Before 1946	11.9%	1.35
After 1960	40.0%	95.5
Occupation*		
White collar	2.0%	10.2%
Blue collar	29.9%	12.1%

\* Based on information obtained in 1971 census. Other data from 1976  
'short' census.

e) In the case of the telephone surveys, households were phoned during the week day, evenings, and on weekends to minimize bias in the socio-economic characteristics of the people contacted. When no one answered, or the line was busy, the interviewer proceeded to the next observation unit. "No answers" were telephoned at least twice. Completed interviews were coded and key punched according to the same format as were the mailed questionnaires.

Mailed questionnaires are more likely to be returned by households in higher socio-economic brackets so that a systematic bias is developed in the response to mailed questionnaires. This bias is less in the response to telephoned interviews. In the first main survey (Nov. 1979) the responses to the mailed and telephoned questionnaires were combined, although they were found to be significantly different in household income. This problem was not present in later surveys.

#### Al.4 SAMPLE SIZES, RESPONSE RATES AND CONFIDENCE LEVELS

Table Al.2 summarizes the data for sample sizes, response rates and confidence levels. Except for the Evacuation Centre sample, the numbers of completed observations in each sample are consistent with a 98% confidence level, and an error of  $\pm 5\%$  assuming a value variability of 50% (Slonin, 1960, p74-75). The Evacuation Centre sample falls a little short of this, but it was decided not to increase the sample size because the universe of Centre Registrations form which the sample was being drawn, was itself found to be a partial sample of the Evacuation Centre users (see section Al.5).

Response rates were unusually high for both the mailed and telephoned surveys (table Al.2); a testimony to the interest of the public in the Mississauga evacuation, and (for the mailed questionnaires) to the support provided by Mayor Hazel McCallion's accompanying letter.

#### A1.5 TESTS FOR REPRESENTATIVENESS

Tests for representativeness (such as, the comparison of socio-economic characteristics between the sample and the total population from which it was drawn) were not performed for the following reasons:

a) The most recent relevant data in the characteristics of the total population are only available for 1971, the year of the last 'long' Canadian census. These data are therefore 9 years out of date.

b) In the case of Mississauga, which has undergone great demographic changes (largely through immigration) in those 9 years, this time difference renders any comparison meaningless;

c) These major demographic changes also limit the validity of any scaling procedures that might be employed to produce projections of the 1980 population characteristics on the basis of the 1971 census data. The assumptions required about constant intertabular relationships over time cannot be upheld for Mississauga.

The inability to perform tests for representativeness is not considered a major problem. The surveys and sampling were conducted according to broadly-accepted and rigorous methodological principles, which would minimize the possibility of a biased or unrepresentative sample.

In the case of the Evacuation Centre users, it is now known that the Registrations from which the sample was drawn, did not include the whole population. This is because not all people registered, and Red Cross Registration Cards were available for only 9 out of 31 Evacuation Centres. Our sample does not include the small Evacuation Centres housing from 9 - 200 evacuees (see Table 4.1), and under-represents others.

The sample is strongly biased towards the International Centre and Streetsville Secondary School. This bias is of most concern for the user evaluations of the Centres discussed in chapter 5, because it is believed that people's needs were best met in the (under-represented) smaller Centres.

#### Al.6 SELECTION AND VALIDITY OF CONTROL GROUP

A control sample was selected primarily to test differences in risk perception between people who had similar exposure to risk but different experience (that is, lived near to a main railway track but had not been evacuated).. Several census tracts near to Toronto and located close to railway tracks were examined in an attempt to find an area that was comparable to Mississauga (census tract 520 which includes the accident location and 85% of the first evacuation zone ) according to the following criteria:

- a) population increase over the last 30 years
- b) proportion of owner-occupied private dwellings
- c) average numbers of persons per household
- d) average number of persons per family
- e) average number of children per family
- f) household mobility
- g) education
- h) participation in labour force
- i) unemployment rate
- j) birthplace
- k) family income
- l) occupation
- m) period of home construction

The area which best fits these criteria is census tract 303.03 in Don Mills (Table Al.3). A sample of 500 households was drawn from this area to act as a control.

Tests comparing the age, sex and income distributions of the main sample of evacuees and the control sample show that they are significantly different. Analysis comparing the two samples must therefore take these differences into account.



Appendix 2

QUESTIONNAIRE USED IN  
FIRST MAIN MAILED SURVEY OF EVACUATION,  
NOVEMBER, 1979

EMERGENCY PLANNING PROJECT  
INSTITUTE FOR ENVIRONMENTAL STUDIES  
UNIVERSITY OF TORONTO

Dear Resident:

We are undertaking a study of the public feelings and response to the evacuation of Mississauga due to the train derailment on Saturday, 10th of November. It would be of great help to our study if someone in your household could complete the following questionnaire and mail it back to us using the enclosed stamped addressed envelope within the next two weeks.

If you wish to add comments or qualify the answers to any of the questions, please feel free to do so. For more information about the study please call 978-6409.

ALL REPLIES ARE FOR UNIVERSITY RESEARCH ONLY AND WILL BE ABSOLUTELY CONFIDENTIAL.

Professor Anne V. Whyte, Diana Liverman, John Wilson

PLEASE CHECK, ANSWER, OR WRITE COMMENT IN SPACE PROVIDED

A. THE ACCIDENT

1. The accident happened around 11:50 p.m. on Saturday night, 10th of November. When did you first hear about the accident?

Sat night 10th Nov \_\_\_\_\_ Sun eve 11th Nov \_\_\_\_\_ Later than this \_\_\_\_\_  
Sun Morn 11th Nov \_\_\_\_\_ Mon Morn 12th Nov \_\_\_\_\_  
Sun aft 11th Nov \_\_\_\_\_ Mon aft 12th Nov \_\_\_\_\_  
Can you specify time? \_\_\_\_\_

2. Where were members of your household at the time of the accident?  
(Please give how many in each category eg. 5 at home)

At home \_\_\_\_\_ In Mississauga but not at home \_\_\_\_\_  
Travelling in Mississauga \_\_\_\_\_ Travelling outside the area \_\_\_\_\_  
In Toronto area \_\_\_\_\_ Outside Toronto area \_\_\_\_\_

3. How did you first learn about the accident?

Radio \_\_\_\_\_ T.V. \_\_\_\_\_ (Which station) \_\_\_\_\_ Newspaper \_\_\_\_\_  
Family member \_\_\_\_\_ Friend or neighbour \_\_\_\_\_ Police \_\_\_\_\_  
Building superintendent \_\_\_\_\_ Saw fire or heard explosion \_\_\_\_\_  
Other (Please specify) \_\_\_\_\_

4. How did you pinpoint the site of the accident?

I knew where: Mavis Road was \_\_\_\_\_ Other (Please specify \_\_\_\_\_)  
CP line was \_\_\_\_\_  
I worked it out from the location of the evacuation zone \_\_\_\_\_

5. What did you think the danger was?

Explosion \_\_\_\_\_ Gases \_\_\_\_\_ (What kind of gas?) \_\_\_\_\_  
Fire \_\_\_\_\_ Didn't think there was a danger \_\_\_\_\_

6. Did you try to get closer to the scene of the accident at any time?

Yes \_\_\_\_\_ No \_\_\_\_\_ (Please give details \_\_\_\_\_)  
Why? (Please specify) \_\_\_\_\_

7. When did you first think that you might have to evacuate?

_____ Sat eve	_____ Sun eve	_____ Mon eve
_____ Sun morn	_____ Mon morn	_____ Tues morn
_____ Sun aft	_____ Mon aft	_____ Later than Tues

8. Did you start to make any preparations at this time? \_\_\_\_\_ Yes \_\_\_\_\_ No  
What did you do? (Tried to confirm what had happened, pack suitcase, water plants, phone relatives etc) Please describe:

9. When were you officially told or asked to evacuate? (Give day and time)

10. From whom did you receive the message to evacuate?

\_\_\_\_\_ Police at door \_\_\_\_\_ Building Superintendent \_\_\_\_\_ neighbour  
\_\_\_\_\_ Loud Hailer truck \_\_\_\_\_ T. V. ( \_\_\_\_\_ Which Station)  
\_\_\_\_\_ Radio \_\_\_\_\_ Family member \_\_\_\_\_ other (please specify)

11. Did you or anyone in your house evacuate your home? \_\_\_\_\_ Yes \_\_\_\_\_ No  
Your work? \_\_\_\_\_ Yes \_\_\_\_\_ No

IF YOUR ANSWER IS NO PLEASE GO TO QUESTION 28

12. When did you actually leave your house? (Give day and time) \_\_\_\_\_

13. When you were evacuated, did you expect to be away for more than a day?

\_\_\_\_\_ Yes \_\_\_\_\_ No Did you plan for such an eventuality? \_\_\_\_\_ Yes \_\_\_\_\_ No

14. What did you take with you when you left the house? \_\_\_\_\_

15. Do you have any pets? \_\_\_\_\_ Yes \_\_\_\_\_ No. What kind and how many? \_\_\_\_\_  
\_\_\_\_\_ IF YES, which pets did you take with you? \_\_\_\_\_

16. Where did you go at first?

\_\_\_\_\_ Friend/ \_\_\_\_\_ Relative/ \_\_\_\_\_ Second home or cottage/ \_\_\_\_\_ moved my  
mobile home/ \_\_\_\_\_ Hotel or motel/ \_\_\_\_\_ Evacuation centre/ \_\_\_\_\_ Other  
(Please specify) \_\_\_\_\_

17. If possible, please state exact location you went to: \_\_\_\_\_  
\_\_\_\_\_
18. How did you get there?  
 \_\_\_\_\_ Your car/ \_\_\_\_\_ Friend or relatives car/ \_\_\_\_\_ Public transit/ \_\_\_\_\_  
 \_\_\_\_\_ Taxi/ \_\_\_\_\_ Special bus/ \_\_\_\_\_ On foot/ Other (Please specify \_\_\_\_\_  
 \_\_\_\_\_)
19. If you had to move again, please note: 2nd move 3rd move 4th move  
 what time you moved: \_\_\_\_\_  
 where you went to: \_\_\_\_\_  
 how you got there: \_\_\_\_\_  
 how long you stayed: \_\_\_\_\_
20. What made you decide to evacuate?  
 \_\_\_\_\_ Warning from TV or Radio \_\_\_\_\_ Asked by police to evacuate  
 \_\_\_\_\_ Neighbours were leaving \_\_\_\_\_ Family  
 \_\_\_\_\_ Other reason (Please specify \_\_\_\_\_)
21. Did you have any problems in evacuating?  
 \_\_\_\_\_ No gasoline for car \_\_\_\_\_ Traffic congestion  
 \_\_\_\_\_ Didn't know where to go \_\_\_\_\_ No money \_\_\_\_\_ Forgot medication  
 \_\_\_\_\_ Couldn't contact people you wanted to go to \_\_\_\_\_ Didn't take  
 sufficient clothes \_\_\_\_\_ Didn't have any means of transport  
 \_\_\_\_\_ Didn't have any problems.  
 Other (Please specify \_\_\_\_\_)
22. When did you return home?  
 \_\_\_\_\_ Monday afternoon \_\_\_\_\_ Wednesday \_\_\_\_\_ Saturday  
 \_\_\_\_\_ Monday evening \_\_\_\_\_ Thursday \_\_\_\_\_ Later (please specify)  
 \_\_\_\_\_ Tuesday \_\_\_\_\_ Friday \_\_\_\_\_ Give time of day if possible
23. Did anyone in your household try to return before you were told to?  
 \_\_\_\_\_ Yes \_\_\_\_\_ No
24. Did you have any major problems in returning to your house?  
 \_\_\_\_\_ No gasoline \_\_\_\_\_ Traffic holdups \_\_\_\_\_ No problems in returning  
 \_\_\_\_\_ No money \_\_\_\_\_ No transport  
 Other (Please specify \_\_\_\_\_)
25. What was the first thing you did on arriving home? \_\_\_\_\_  
 \_\_\_\_\_

26. What did you realise you had forgotten to do?(e.g. Switch off lights, put away food,) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
27. What would you do in similar circumstances next time? (use back of page if necessary) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

GO TO QUESTION 29 IF YOU EVACUATED. ANSWER QUESTION 28 IF YOU DID NOT EVACUATE

28. Why didn't you evacuate?  
\_\_\_\_\_ No place to go \_\_\_\_\_ Could not leave job or business  
\_\_\_\_\_ No apparent reason to evacuate \_\_\_\_\_ Too old or infirm  
\_\_\_\_\_ Fear of looting \_\_\_\_\_ Worried about pets \_\_\_\_\_ Was not asked to leave  
\_\_\_\_\_ No one else in my area evacuated \_\_\_\_\_ Other (Please specify \_\_\_\_\_)  
\_\_\_\_\_
29. Have you ever been evacuated before?  
Yes, for the Texaco fire last year \_\_\_\_\_ Yes for other emergency (specify if you wish \_\_\_\_\_) \_\_\_\_\_ No, never.
30. Do you think the evacuation was justified?  
\_\_\_\_\_ Yes \_\_\_\_\_ No (Please comment \_\_\_\_\_)  
\_\_\_\_\_  
\_\_\_\_\_
31. What were the main effects of the emergency on your household? \_\_\_\_\_  
\_\_\_\_\_
32. Were there any benefits? (Please describe \_\_\_\_\_)  
\_\_\_\_\_
33. What were you worried about while you were away from home?  
\_\_\_\_\_ Pets left at home \_\_\_\_\_ Medication left at home  
\_\_\_\_\_ Plants left at home \_\_\_\_\_ Difficulties in contacting relatives and friends  
\_\_\_\_\_ Looting \_\_\_\_\_ Other (Please specify \_\_\_\_\_)
34. Who do you think should provide compensation for any problems?  
\_\_\_\_\_ Federal Gov't \_\_\_\_\_ Prov Gov't \_\_\_\_\_ Mississauga Local Gov't

\_\_\_\_\_ CP Rail \_\_\_\_\_ Owner of chemicals \_\_\_\_\_ Owner of rail wagons  
 \_\_\_\_\_ Compensation not necessary

35. Did you know before the accident that there were hazardous materials passing by rail through Mississauga? \_\_\_\_\_ Yes \_\_\_\_\_ No
36. Were you ever concerned about this before? \_\_\_\_\_ Yes \_\_\_\_\_ No
37. Do you have any other environmental concerns? (Please specify \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_)
38. How would you describe your feelings about transportation of hazardous materials now? \_\_\_\_\_ No different \_\_\_\_\_ Feelings have changed (Please describe  
 \_\_\_\_\_  
 \_\_\_\_\_)
39. Could you describe how your feelings about the evacuation changed from the first day to the day you returned home or back to work? (Use back of page if necessary) \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
40. Where do you live? (Nearest intersection \_\_\_\_\_)
41. How far is your home from the accident site? \_\_\_\_\_ Within one mile  
 \_\_\_\_\_ 1-2 miles \_\_\_\_\_ 2-3 miles \_\_\_\_\_ 3-5 miles \_\_\_\_\_ over 5 miles
42. How long have you lived in Mississauga? \_\_\_\_\_ years  
 How long have you lived in Canada? \_\_\_\_\_ years
43. Do you own an automobile? \_\_\_\_\_ Yes \_\_\_\_\_ No
44. What is the occupation of the head of household? \_\_\_\_\_
45. How many people are in your household? \_\_\_\_\_
46. How many children are there under 18? \_\_\_\_\_
47. What is the approximate age of the head of the household?  
 \_\_\_\_\_ 18-25 \_\_\_\_\_ 30-40 \_\_\_\_\_ over 60  
 \_\_\_\_\_ 25-30 \_\_\_\_\_ 40-60
48. In which of the following categories would you place your gross family income?  
 \_\_\_\_\_ Less than \$10,000 \_\_\_\_\_ \$20,000 to \$25,000  
 \_\_\_\_\_ \$10,000 to \$15,000 \_\_\_\_\_ \$25,000 to \$30,000  
 \_\_\_\_\_ \$15,000 to \$20,000 \_\_\_\_\_ Over \$30,000

IF YOU WOULD LIKE A SUMMARY OF OUR RESULTS PLEASE PUT YOUR NAME AND ADDRESS BELOW:

Appendix 3

QUESTIONNAIRE USED IN  
SECOND MAIN MAILED SURVEY OF EVACUATION  
JULY 1980

AND SURVEY OF EVACUATION CENTRE USERS  
JULY 1980

NOTE: Questions 40-44 were only used in  
the Survey of Evacuation Centre  
Users.



MISSISSAUGA EVACUATION RESEARCH PROJECT  
INSTITUTE FOR ENVIRONMENTAL STUDIES  
UNIVERSITY OF TORONTO  
 Telephone 978-6792

SURVEY OF MISSISSAUGA RESIDENTS' VIEWS

Please complete this questionnaire and mail it back to us, in the envelope provided, within two weeks. No stamp is needed. Thank you.

ALL REPLIES WILL REMAIN ABSOLUTELY CONFIDENTIAL AND WILL BE USED, IN TABULATED FORM, FOR RESEARCH ONLY.

The accident happened around 11:55 P.M. on Saturday night, November 10th last year.

1. How many members of your household (including children) were in your home at that time? (Please circle number)

people at home	0	1	2	3	4	5	6	7	8	9+
people away from home	0	1	2	3	4	5	6	7	8	9+

2. Were you evacuated from:

Please check one

your home ☐

work ☐

both home and work ☐

neither: we decided to remain inside evacuation area ☐

3. Did you all leave at the same time?

Yes ☐ No ☐

4. How many days were you away from home? (Please circle)

0 1 2 3 4 5 6 7 8 9 + days

5. How many vehicles did you use to evacuate from your home? (Please circle)

0 1 2 3 4+ vehicles

6. Did any member of your household go back into the evacuated area (for example, to check on pets, property)?

Yes ☐ No ☐

7. For your FIRST move, did you go to:

Please check one

friends ☐

relatives ☐

hotel/motel ☐

How many days did you stay? \_\_\_\_\_ evacuation centre ☐

second home ☐

(Please give details) \_\_\_\_\_ other ☐

8. WHERE did you go first? (Please give nearest main intersection or community)

16	17	18
----	----	----

## UNIVERSITY OF TORONTO SURVEY

2.

PLEASE DO  
NOT WRITE  
IN HERE.9. Did you have ENOUGH information about:

	Yes	No
what was happening	<input type="checkbox"/>	<input type="checkbox"/>
amount of danger	<input type="checkbox"/>	<input type="checkbox"/>
when you might be evacuated	<input type="checkbox"/>	<input type="checkbox"/>
when you could return	<input type="checkbox"/>	<input type="checkbox"/>
people you were concerned about	<input type="checkbox"/>	<input type="checkbox"/>
your pets left behind	<input type="checkbox"/>	<input type="checkbox"/>
the security of your property	<input type="checkbox"/>	<input type="checkbox"/>
anything else? please give details	<input type="checkbox"/>	<input type="checkbox"/>

<input type="checkbox"/>	19
<input type="checkbox"/>	20
<input type="checkbox"/>	21
<input type="checkbox"/>	22
<input type="checkbox"/>	23
<input type="checkbox"/>	24
<input type="checkbox"/>	25
<input type="checkbox"/>	26

10. Which INFORMATION SOURCES about the danger did you feel were most reliable?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	28	29

11. Which MEDIA REPORTS did you feel were most accurate?

(Please specify if possible)

Radio	<input type="checkbox"/>	<input type="checkbox"/>
TV	<input type="checkbox"/>	<input type="checkbox"/>
Newspaper	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>

<input type="checkbox"/>	<input type="checkbox"/>
30	31
<input type="checkbox"/>	<input type="checkbox"/>
32	33

12. Did you feel that you were getting the real story during the emergency? (Check one)Yes ☐ No ☐ Not sure ☐

<input type="checkbox"/>
34

13. Even though the length of the evacuation could not be predicted, do you think the evacuees should have been warned that the evacuation might last for several days? (Check one)Yes ☐ No ☐

<input type="checkbox"/>
35

14. Did you know before the accident that there were hazardous materials passing by rail through Mississauga? (Check one)Yes ☐ No ☐

<input type="checkbox"/>
36

15. Would you say you were concerned about this (hazardous goods transport) before the accident? (Check one)Very  
Concerned ☐ Concerned ☐ Not  
Concerned ☐

<input type="checkbox"/>
37

## UNIVERSITY OF TORONTO SURVEY

PLEASE DO  
NOT WRITE  
IN HERE.

☐

38

16. How concerned are you TODAY about it?

Very Concerned ☐ Concerned ☐ Not Concerned ☐

We would like to know how people compare the risks from the Mississauga accident with other events.

17. (a) For the following events, could you please indicate what you think the chances are of the event happening in Southern Ontario in the next ten years?

## CHANCE OF IT HAPPENING

	Very Likely	Likely	Unlikely	Very Unlikely
Another derailment as serious as Mississauga	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Road accident involving dangerous release of hazardous chemicals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plane crash involving many deaths	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nuclear reactor accident as serious as 3 Mile Island	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(b) What risks or hazards concern you most?

---



---

Why? \_\_\_\_\_

---

The survey is also trying to find out how much the emergency cost Mississauga residents. Could you please tell us:

18. During the time in which you were away from home due to the evacuation, what ADDITIONAL expenses did your whole household have that you would not otherwise have had?

accommodation \$ \_\_\_\_\_  
 food \$ \_\_\_\_\_  
 travel \$ \_\_\_\_\_  
 other expenses \$ \_\_\_\_\_

TOTAL \$ \_\_\_\_\_

☐

39

☐

40

☐

41

☐

42

☐

43 44 45

☐

46 47

☐

48

☐

49

☐

50

☐

51

☐

52

## UNIVERSITY OF TORONTO SURVEY

4.

PLEASE DO  
NOT WRITE  
IN HERE.

19. In the 5 days following your return home, what ADDITIONAL expenses did your household have, that you would not otherwise have had?

accommodation \$ \_\_\_\_\_

food \$ \_\_\_\_\_

travel \$ \_\_\_\_\_

other expenses \$ \_\_\_\_\_

TOTAL \$ \_\_\_\_\_

	53
	54
	55
	56
	57

20. Did anyone in your household lose time at work and/or income due to the Mississauga emergency?

	<u>No</u>	<u>Yes</u>	<u>Number of days lost</u>	<u>Income Lost</u>
Person 1	<input type="checkbox"/>	<input type="checkbox"/>	_____ days	\$ _____
Person 2	<input type="checkbox"/>	<input type="checkbox"/>	_____ days	\$ _____
Others:				

58	59	60
61	62	63
64	65	66

21. What were the reasons for not working? (Check as many as necessary)

	<u>Workplace Closed</u>	<u>No Transport</u>	<u>Routes Closed</u>	<u>Evacuated Far Away</u>	<u>Other (please describe below)</u>
Person 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Person 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Others:					

	67
	68
	69
	70

22. After you returned to work, did members of your household do overtime to make up for the time lost?

	<u>No</u>	<u>Yes</u>	<u>Number of hours overtime</u>
Person 1	<input type="checkbox"/>	<input type="checkbox"/>	_____ hours
Person 2	<input type="checkbox"/>	<input type="checkbox"/>	_____ hours
Others:			

71	72
73	74
75	76

23. Did you apply for compensation from CP Rail?

Yes <input type="checkbox"/>	No <input type="checkbox"/> → Why not? _____
↓	
How much did you claim? \$ _____	
How much did you receive? \$ _____	

77	78
79	
80	

1	2	3

UNIVERSITY OF TORONTO SURVEY

EASE DO  
NOT WRITE  
IN HERE.

24. Would the amount of all your claims (to CP Rail, Insurance Companies and others), if paid, fully compensate your household for the damages and costs of the emergency to you?

Yes ☐

No ☐ *Is this because it would not cover: (Check as many as necessary)*

*all our out-of-pocket expenses* ☐

*all our lost income* ☐

*our exposure to danger* ☐

*the disruption and anxiety suffered* ☐

*(Please describe) anything else?* ☐

25. Do you have any comments about the way CP Rail compensated evacuees?

26. What do you feel about the role the Ontario government played in relation to compensation?

27. At any time during the emergency, were you seriously concerned for your own or your family's safety?

Very Concerned ☐ Concerned ☐ Not Concerned ☐

Why? \_\_\_\_\_

28. What were the longer term good and bad effects for you, personally?

29. If someone were to offer a sum of money to you, how much would you consider necessary to FULLY compensate your household for all the effects of the emergency?

No money is necessary (\$0) ☐ \$500 - 1000 ☐ Over \$2000 ☐  
\$1 - 500 ☐ \$1000 - 2000 ☐ No amount of money can fully compensate us ☐

30. Do you think the evacuation was justified?

Yes ☐ No ☐

Please comment \_\_\_\_\_



## UNIVERSITY OF TORONTO SURVEY

6.

31. If you were evacuated again, what would you do differently?

PLEASE DO  
NOT WRITE  
IN HERE.

--	--

15 16

This information is needed to help us to tabulate people's answers by evacuation zone and the usual social statistics. Individual answers are confidential.

32. Where do you live? (Nearest main intersection)

--	--	--

17 18 19

Do you own ☐ or rent ☐ your home?

33. How many people altogether are there living in your household?  
(Please circle)

1 2 3 4 5 6 7 8 9+

20

34. How many of these are children aged

0-9 years

10-19 years

21

22

23

35. How many people in your household were employed in November 1979?  
(Please circle)

0 1 2 3 4 5 6 7 8 9+

24

36. What is the occupation of the head of the household? (Please check below or give specific occupation here if you prefer)

Industrial or construction worker ☐ Professional or managerial ☐  
Transportation worker ☐ Clerical, sales and service ☐  
Homemaker ☐ Retired ☐  
Self-employed ☐

25

37. What is the approximate age of the head of household?

Under 20 years ☐ in 50's ☐  
in 20's ☐ in 60's ☐  
in 30's ☐ in 70's ☐  
in 40's ☐ Over 70 years ☐

26

38. In which of the following categories would you place your annual gross household income?

Less than \$15,000 ☐  
\$15,000 - \$30,000 ☐  
More than \$30,000 ☐

27

39. Please indicate the sex of the person completing this questionnaire.

Male ☐ Female ☐

28

29

30

## UNIVERSITY OF TORONTO SURVEY

7.

PLEASE DO  
NOT WRITE  
IN HERE.If you stayed in one or more evacuation centers, would you please  
answer the following questions.40. Please complete the table below.

	Name of Evacuation Center	Time and Date of Arrival	Time and Date of Departure	Kind of Vehicle Used in Arrival	Kind of Vehicle Used for Departure
First Center					
Second Center					
Third Center					
Fourth Center					
Return home	_____		_____		_____

Please answer questions 38-40 for the evacuation center in which you  
spent the most time.41. While you were staying in the evacuation center, did you, or anyone in  
your family, take a trip away from the center and later return?Yes ☐No ☐

How many times? 0 1 2 3 4 5 6 7 8 9+

For what reason(s)? \_\_\_\_\_

42. How did you feel about the following facilities in the evacuation  
center?

	<u>Excellent</u>	<u>Adequate</u>	<u>Inadequate</u>
a) Food quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Sleeping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Washroom	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Recreation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Health care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments: \_\_\_\_\_

72 73



PLEASE DO  
NOT WRITE  
IN HERE.

43. In your opinion, how well was the evacuation center run?

Very well ☐ Adequately ☐ Poorly ☐

☐

74

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

75

76

44. Do you have any further comments or suggestions about evacuation centers?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

77

78

☐

79

THANK YOU VERY MUCH FOR TAKING THE TIME TO ANSWER THIS QUESTIONNAIRE.  
IF YOU WOULD LIKE A SUMMARY OF THE RESULTS, PLEASE FILL IN YOUR NAME  
AND ADDRESS ON THE COVER PAGE.

Appendix 4

QUESTIONNAIRE USED IN  
TELEPHONE SURVEY OF HOUSEHOLDS  
OUTSIDE EVACUATION ZONE

JUNE - JULY 1980

MISSISSAUGA TELEPHONE SURVEY OF RESIDENTS IMMEDIATELY  
OUTSIDE THE EVACUATION ZONE

Telephone number

Zone

Month

Day

House/  
Apt.

Sex

Inter-  
viewer

1	2	3

4	5	6	7

8

9

10	11

12

13

14

Hello, my name is \_\_\_\_\_. I'm calling from the University of Toronto. You may have heard that the University is doing a research project on the evacuation that took place in Mississauga last November 10th.

We are trying to find out how many people who lived nearby may have ~~evacuated~~ voluntarily even though they were outside the official zone.

1. Would you mind just telling me if you were at home at the time of the accident. (Prompt if doesn't know - You remember it happened at about midnight on Saturday night, November 10th last year - 1979).

(Circle)    Yes 1        No 5        Not sure 7        NA 0

15

2. Were all your household members together at the time or were some away from home?

(Circle)    All at home 1  
              Some at home 5  
              None at home 7  
              No answer 0

16

3. Did any member of your household evacuate at any time during the emergency? (Prompt: Sat. 10 to Friday 16 November).

(Circle one)

Yes, all of us 1
No one 7
GO TO QUESTION 5

GO TO QUESTION 4

17

Yes, some of us 5

- (a) Would you mind telling me who left?

- 1 children (under 20 years)  
 2 mother  
 3 father  
 4 older people (over 60 years)  
 5 visitors staying with us  
 6 other (specify) \_\_\_\_\_

GO TO QUESTION 4

18	19	20

4. When did you ) go and return?  
they)

(Can read out dates to help them if necessary).

Date left

Date returned

(Circle one)

- 1 Sun. 11th  
2 Mon. 12th  
3 Tues. 13th  
4 Wed. 14th  
5 Thurs. 15th  
6 Fri. 16th  
7 Other (specify) \_\_\_\_\_  
\_\_\_\_\_  
0 No answer

- 1 Sun. 11th  
2 Mon. 12th  
3 Tues. 13th  
4 Wed. 14th  
5 Thurs. 15th  
6 Fri. 16th  
7 Sat. 17th  
8 After 17th  
9 Other (specify) \_\_\_\_\_  
0 No answer

Left

☐

21

Ret

☐

22

5. Why did you decide (not) to evacuate? (Check first two mentioned only)

DO NOT READ OUT

NON-EVACUEES

EVACUEES

(Circle one)

(Circle one)

- 1 Not asked to  
2 Not enough risk  
3 Nowhere to go  
4 Not in the evacuation zone  
5 News seemed OK  
6 Other (specify) \_\_\_\_\_  
\_\_\_\_\_  
0 No answer

- 1 In case of danger  
2 Saw others going  
3 Were advised to  
4 Supplies short/shops closed  
5 Worried/frightened  
6 Other (specify) \_\_\_\_\_  
\_\_\_\_\_  
0 No answer

Non-E

☐

23 24

Evac

☐

25 26

6. Do you know anyone personally who did evacuate? (either inside or outside evacuation zone)

(Circle) Yes 1 No 5 NA 0

☐

27

7. Did you know BEFORE the accident that there were hazardous materials passing by rail through Mississauga?

Yes 1 No 5 GO TO QUESTION 8

☐

28

- (a) Would you say you were concerned about this (hazardous goods transport) before the accident?

Very concerned 1 Concerned 3 Not concerned 5 NA 0

☐

29

8. How concerned are you today about it?

Very concerned 1    Concerned 3    Not concerned 5    NA 0

9. Did you feel that you were getting the real story during the emergency?

(Circle) Yes 1    No 5    Not sure 7    No answer 0

10. Could I just ask you finally how many people are in your household (normally live with you)?

(Circle one) 1 2 3 4 5 6 7 8 9+

11. How many of these children are under 20 years?

(Circle one) 1 2 3 4 5 6 7 8 9+

12. What is the age of the head of the household to the nearest 10 years?

(Circle one) Under 20 1    30's 3    50's 5    70's 7  
                                  20's 2    40's 4    60's 6    over 70 8  
    NA 0

THANK YOU SO MUCH. YOU HAVE BEEN MOST HELPFUL.

INTERVIEWER: Enter any additional comments here and circle below.

Additional comments Yes 1    No 3

Appendix 5

QUESTIONNAIRE USED IN  
TELEPHONE SURVEY OF CONTROL SAMPLE

JUNE - JULY 1980

MISSISSAUGA PROJECT TELEPHONE SURVEY OF CONTROL SAMPLE

Telephone number							Zone	Month	Day	Own/ Rent	Sex	Inter- viewer	
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Hello, my name is \_\_\_\_\_. I'm calling from the University of Toronto. You may have heard that the University is doing a research project on the evacuation that took place in Mississauga last November 10th.

We are calling a few people in Metro Toronto to get some idea of what other people thought about the emergency and whether they tried to contact friends inside the evacuated area.

Could I ask you just a few questions? They will take less than five minutes. Thank you.

The derailment accident in Mississauga happened around 11:55 P.M. on Saturday night, November 10th last year.

1. Could you please tell me when you first heard about the accident?  
(You can help respondent to remember days, dates, etc.)

Heard or saw it happen 1	Tues. (13 Nov) 5
Sunday A.M. (11th) 2	Wed. (14 Nov) 6
Sunday P.M. (11th) 3	After Wednesday 7
Monday (12 Nov) 4	Can't remember 8
	No answer 0

  
15

2. How did you hear about it?

Heard/saw it 1	Friends/relatives in Mississauga 5
Radio 2	Other people I know 6
TV 3	Other (specify) _____ 7
Newspaper 4	Can't remember 8
	No answer 0

  
16



3. Do you have any relatives or friends in the evacuated area?

GO TO QUESTION 4 ← No 1

Yes 3

Did you try to contact them?

No 1

Yes 3

How?

Phone directly 1

Tried to go there 3

CB radio 5

Asked other people about them 7

Other (specify) \_\_\_\_\_ 9

No answer 0

4. Did you receive any evacuees in your home?

No 1

Yes 3

How many? 1 2 3 4 5 6 7 8 9+ people

For  
how long? 1 2 3 4 5 6 7 8 9+ days

5. Did any member of your household (people who normally live with you) evacuate your home at any time during the emergency?

No 1

Yes 3

How many? 1 2 3 4 5 6 7 8 9+ people

For  
how long? 1 2 3 4 5 6 7 8 9+ days

6. Did you know BEFORE the accident that there were hazardous materials passing by rail through Mississauga and other communities in Metro Toronto?

Yes 1 No 5 → GO TO QUESTION 8

(a) Would you say you were concerned about this (hazardous goods transport) before the accident?

Very  
Concerned 1

Concerned 3

Not  
Concerned 5

NA 0

17

18

19

20

21

22

23

24

25

26

27

7. How concerned are you today about it?

Very  
Concerned 1      Concerned 3      Not  
Concerned 5      NA 0

☐  
28

We would like to know how people compare the risks from the Mississauga derailment with other possible hazards in Metro Toronto.

I'm going to read out four (hypothetical) accidents and I'd like you to tell me how likely you think the chances are of each one happening in Southern Ontario sometime in the next 10 years.

It's just what you think that we're after because no one can know for sure.

8. (a)

CHANCE OF IT HAPPENING

	Very <u>Likely</u>	<u>Likely</u>	<u>Unlikely</u>	Very <u>Unlikely</u>	Don't <u>Know</u>	No <u>Answer</u>
Another derailment as serious as Mississauga	1	3	5	7	9	0
Road accident involving dangerous release of hazardous chemicals	1	3	5	7	9	0
Plane crash involving many deaths	1	3	5	7	9	0
Nuclear reactor accident as serious as 3 Mile Is.	1	3	5	7	9	0

☐  
29

☐  
30

☐  
31

☐  
32

(b) What risks or hazards concern you most? (considering more than those mentioned above) \_\_\_\_\_

☐ ☐  
33 34

Why? \_\_\_\_\_

☐ ☐  
35 36

9. At any time during the emergency, were you concerned for your own (family's) safety?

Very  
Concerned 1      Concerned 3      Not  
Concerned 5      NA 0

☐  
37

10. Do you think the evacuation was justified?

Yes 1      No 3      Don't know 9      No answer 0

Please comment \_\_\_\_\_

☐  
38

☐  
39

11. Did you feel that you were getting the real story during the emergency?

(Circle) Yes 1 No 5 Not sure 7 No answer 0

☐  
40

12. If it were possible, how much money would you be willing to pay to AVOID having to go through an emergency like the one in Mississauga last November? (Circle one)

No money 1 \$1000 - \$2000 4 No idea 9  
\$1 - 500 2 Over \$2000 5 No answer 0  
\$500 - 1000 3 Any amount of money 6  
would be worth it

☐  
41

13. Could I just ask you finally how many people are in your household (normally live with you)?

(Circle one) 1 2 3 4 5 6 7 8 9+

☐  
42

14. Any how many of these are children under 20 years?

(Circle one) 1 2 3 4 5 6 7 8 9+

☐  
43

15. What is the age of the head of the household to the nearest 10 years?

(Circle one) Under 20 1 30's 3 50's 5 70's 7  
20's 2 40's 4 60's 6 Over 70 8  
NA 0

☐  
44

16. Is your gross household income above \$15,000 or above \$30,000 a year?

Below \$15,000 1 Above \$30,000 5  
15 - \$30,000 3 No answer 0

☐  
45

THANK YOU VERY MUCH. YOU HAVE BEEN MOST HELPFUL.

INTERVIEWER: Enter any additional comments here and circle below.

Additional comments - Yes 1 No 3

☐  
46

Appendix 6

QUESTIONNAIRE USED IN  
MAILED BUSINESS SURVEY  
MARCH, 1981

## MISSISSAUGA EVACUATION RESEARCH PROJECT

Business Survey

1. This firm was closed \_\_\_\_\_ working days due to the evacuation.
2. What is the major product or service of this firm? \_\_\_\_\_  
\_\_\_\_\_.
3. Into which category does your business fall?  

<input type="checkbox"/> Retail	<input type="checkbox"/> Wholesale
<input type="checkbox"/> Manufacturing	<input type="checkbox"/> Services
4. Due to the evacuation, this firm's annual revenue for 1979 was affected, as closely as can be judged, as follows: (check the appropriate box)  

<input type="checkbox"/> (a) Annual revenue was unaffected.
<input type="checkbox"/> (b) Revenue fell, but less than in proportion to the number of days closed.
<input type="checkbox"/> (c) Revenue fell in proportion or more than in proportion to the number of days closed.
5. Due to the evacuation, this firm's annual expenses for 1979 were affected, as closely as can be judged, as follows: (check the appropriate box)  

<input type="checkbox"/> (a) Total expenses for 1979 were unaffected.
<input type="checkbox"/> (b) Total expenses for 1979 increased (e.g., inventory spoilage, overtime pay)
<input type="checkbox"/> (c) Total expenses for 1979 were lower than they otherwise would have been (e.g., lower fuel costs, temporary staff employed)

Comments:

Appendix 7SUMMARY OF CHI-SQUARE TEST

In this appendix, the results of some of the main statistical analyses applied to the survey data are given. The most common test used is the Chi-square Test. This is a general test which can be applied to nominal data with any number of categories. It is used to test whether or not frequencies, which have been empirically obtained for different sets of data, differ significantly from those which would be expected, assuming that there are no difference between the data sets (that is, they all belong to a single population). For example, the test can be used to see if the people who went to Evacuation Centres are significantly different from other evacuees in income, or in the number of children they have.

The larger the differences between observed and expected frequencies, the larger the value of Chi-square. However, the observed and expected frequencies will rarely be exactly the same. If the value of Chi-square is larger than that expected by chance, then the frequencies are said to be significantly different.

The level of significance is determined by using a Chi-square table, in which values of Chi-square are given, for different degrees of freedom. A significance level of .001, for example, means that, if all assumptions are correct, the obtained value for Chi-square would occur by chance only one time in a thousand. It can reasonably be assumed, therefore, that a significant difference exists between the data sets.

## SUMMARY OF CHI-SQUARED TESTS

### Introduction

The following is a summary of contingency tables (crosstabulations) produced for selected pairs of dependent and independent variables. In all cases, the dependent variable is underlined and is followed by a list of independent variables against each of which it has been cross-tabulated. For each pair of variables, the chi-squared statistic and its significance is given. For the direction of the significant relationships see the text.

### Key

$\lambda$  = chi-squared  
 df = degree of freedom  
 $p_{\leq}$  = significant relationship  
 NS = no significant differences

SECOND MAIN MAILED SURVEY OF EVACUATION, JULY 1980 (see Appendix 3 for questionnaire used).

Question 8.

Where did you go first? (nearest main intersection or community)

### Direction moved during evacuation

By:

Residential zone	$\lambda$ = 84.457 91df NS 0.6727
*Distance travelled	$\lambda$ = 117.075 56df $p_{\leq}$ 0.0000
Household size	$\lambda$ = 44.426 49df NS 0.6588

### Distance travelled during evacuation

By:

Residential zone	$\lambda$ = 109.221 104df NS 0.3438
Safety concern	$\lambda$ = 23.760 16df NS 0.0949
Household size	$\lambda$ = 60.352 56df NS 0.3214



## Question 32.

Where do you live? (analysis only includes evacuation zones closest to accident (zones 1 to 8))

By:

Occupation	$\lambda =$	37.512	36df	NS	0.3996
Age	$\lambda =$	26.162	24df	NS	0.2141
Income	$\lambda =$	8.425	12df	NS	0.7510
Sex	$\lambda =$	2.974	6df	NS	0.8121
*Own or rent house	$\lambda =$	16.380	6df	$p \leq$	0.0119

## Question 34.

How many of these are young children aged 0 - 9 years?

By:

Occupation	$\lambda =$	32.230	18df	NS	0.0206
*Age	$\lambda =$	127.517	21df	$p \leq$	0.0000
Income	$\lambda =$	13.631	9df	NS	0.1360
Residential zone	$\lambda =$	53.081	39df	NS	0.0657
Own or rent house	$\lambda =$	9.389	3df	NS	0.0245

## Question 37.

What is the approximate age of the head of the household?

By:

*Occupation	$\lambda =$	93.981	6df	$p \leq$	0.0000
Sex	$\lambda =$	0.726	1df	NS	0.3939
Residential zone	$\lambda =$	15.386	13df	NS	0.2839
Own or rent house	$\lambda =$	0.753	1df	NS	0.3855

## Question 6.

Did any member of your household go back into the evacuated area (for example, to check on pets, property)?

(Responses: yes, no)

By:

Occupation	$\lambda =$	11.230	6df	NS	0.0815
Sex	$\lambda =$	0.0	1df	NS	1.0000
Residential zone	$\lambda =$	13.974	13df	NS	0.3756
Days away from home	$\lambda =$	15.041	8df	NS	0.0563

## Question 9.

Did you have ENOUGH information about;*(Responses: yes, no)*a) your pets left behind?

By:

Residence in evacuation zones nearest to accident (zones 1-8)	$\lambda =$	6.418	6df NS 0.3780
--	-------------	-------	---------------

Presence or absence of young children in family	$\lambda =$	3.937	3df NS 0.2683
--	-------------	-------	---------------

Younger (20-49yrs) versus older (50-over 80yrs) people	$\lambda =$	0.682	1df NS 0.4087
---	-------------	-------	---------------

Whether they attempted to return	$\lambda =$	2.689	1df NS 0.1010
-------------------------------------	-------------	-------	---------------

b) the security of your property?

By:

Residence in evacuation zones nearest to accident (zones 1-8)	$\lambda =$	2.242	6df NS 0.6440
--	-------------	-------	---------------

Presence of absence of young children in family	$\lambda =$	3.913	3df NS 0.2709
--	-------------	-------	---------------

Younger (20-49yrs) versus older (50-over 80yrs) people	$\lambda =$	1.621	1df NS 0.2029
---	-------------	-------	---------------

Whether they attempted to return	$\lambda =$	1.646	1df NS 0.1994
-------------------------------------	-------------	-------	---------------

## Question 10.

Which INFORMATION SOURCES about the danger did you feel were most reliable?*(Responses: radio, TV, newspaper, police, mayor, friends, etc.)*

By:

Was there enough information about:

What was happening?	$\lambda =$	9.997	8df NS 0.2652
---------------------	-------------	-------	---------------

The amount of danger?	$\lambda =$	9.266	8df NS 0.3203
-----------------------	-------------	-------	---------------

When you might be evacuated?	$\lambda =$	14.123	8df NS 0.0786
------------------------------	-------------	--------	---------------

Question 10 continued.

When you could return?	$\lambda = 5.860$ 8df NS 0.6628
Did you feel you were getting the real story?	$\lambda = 17.111$ 16df NS 0.3784
Time between accident and warning to evacuate.	$\lambda = 4.882$ 8df NS 0.7700

## Question 11.

Which MEDIA REPORTS did you feel were most accurate?*(Responses: radio, TV, newspaper)*

By:

Was there enough information about:

What was happening?	$\lambda = 1.281$ 2df NS 0.5270
The amount of danger?	$\lambda = 2.100$ 2df NS 0.3498
When you might be evacuated?	$\lambda = 3.937$ 2df NS 0.1397
When you could return?	$\lambda = 7.279$ 2df NS 0.0263
Time between accident and warning to evacuate.	$\lambda = 0.191$ 2df NS 0.9085

## Question 12.

Did you feel that you were getting the real story during the emergency?*(Responses: yes, no, not sure)*

By:

Residence in evacuation zones nearest to accident (zones 1-8)	$\lambda = 10.244$ 12df NS 0.5945
*Presence or absence of young children in family	$\lambda = 18.675$ 6df $p \leq 0.0047$
*Younger (20-49yrs) versus older (50-over 80yrs) people	$\lambda = 8.432$ 2df $p \leq 0.0148$
Whether they attempted to return	$\lambda = 3.179$ 2df NS 0.2040

## Question 15.

Would you say you were concerned about this (hazardous goods transport) before the accident?

*(Responses: very concerned, concerned, not concerned)*

By:

Sex	$\lambda =$	6.300	2df	NS	0.0428
Age	$\lambda =$	9.517	14df	NS	0.7965
Presence or absence of young children in family	$\lambda =$	3.485	6df	NS	0.7460
Residence in evacuation zones nearest to accident (zones 1-8)	$\lambda =$	8.744	12df	NS	0.7245
Younger (20-49yrs) versus older (50-over 80yrs) people	$\lambda =$	1.092	2df	NS	0.5791
Whether they attempted to return	$\lambda =$	0.435	2df	NS	0.8041

## Question 16.

How concerned are you TODAY about it?

*(Responses: very concerned, concerned, not concerned)*

By:

Sex	$\lambda =$	0.692	2df	NS	0.7072
Age	$\lambda =$	14.095	14df	NS	0.4426
Presence or absence of young children in family	$\lambda =$	2.282	6df	NS	0.8919
Residence in evacuation zones nearest to accident (zones 1-8)	$\lambda =$	9.103	12df	NS	0.6940
Younger (20-49yrs) versus older (50-over 80yrs) people	$\lambda =$	0.586	2df	NS	0.7458
Whether they attempted to return	$\lambda =$	2.134	2df	NS	0.3440

## Question 13.

Even though the length of the evacuation could not be predicted, do you think the evacuees should have been warned that the evacuation might last for several days?

(Responses: yes, no)

By:

Residence in evacuation zones nearest to accident (zones 1-8)	$\lambda =$	3.231	6df	NS	0.7793
Presence or absence of young children in family	$\lambda =$	0.916	3df	NS	0.8214
Younger (20-49yrs) versus older (50-over 80yrs) people	$\lambda =$	0.023	1df	NS	0.8920
Whether they attempted to return	$\lambda =$	0.002	1df	NS	0.9568

## Question 27.

At any time during the emergency, were you seriously concerned for your own or your family's safety?

(Responses: very concerned, concerned, not concerned)

By:

Residence in evacuation zones nearest to accident (zones 1-8)	$\lambda =$	9.872	12df	NS	0.6272
Residential zone	$\lambda =$	20.409	26df	NS	0.7718
Household size	$\lambda =$	23.023	14df	NS	0.0599
*Sex	$\lambda =$	10.572	2df	$p \leq$	0.0051
*Presence or absence of young children in family	$\lambda =$	21.085	6df	$p \leq$	0.0018
Presence of absence of older children in family	$\lambda =$	6.937	8df	NS	0.5434
*Money needed to fully compensate the accident experience	$\lambda =$	61.493	10df	$p \leq$	0.0000
*Reasons they were concerned for families safety	$\lambda =$	177.992	16df	$p \leq$	0.0000
*Younger (20-49yrs) versus older (50-over 80yrs) people	$\lambda =$	12.584	2df	$p \leq$	0.0019
Whether they attempted to return	$\lambda =$	0.298	2df	NS	0.8612

## Question 28.

What were the longer term good and bad effects for you, personally?

(Responses: more aware, more nervous, more prepared, more confident in government, appreciate life, no effects, long-term health effects)

By:

Residence in evacuation zones nearest the accident (zones 1-8)	$\lambda =$	52.742	48df	NS	0.2958
*Presence or absence of young children in family	$\lambda =$	59.712	24df	$p \leq$	0.0001
Younger (20-49yrs) versus Older (50-over 80yrs) people	$\lambda =$	17.086	8df	NS	0.0292
Whether they attempted to return	$\lambda =$	8.410	8df	NS	0.3944

## Question 29.

If someone were to offer a sum of money to you, how much would you consider necessary to FULLY compensate your household for all the effects of the emergency?

(Responses: no money necessary, \$1-\$500, \$500-\$1,000, \$1,000-\$2,000, over \$2,000, no amount can fully compensate us)

By:

*Residential zone	$\lambda =$	108.832	65df	$p \leq$	0.0005
Residence in evacuation zones nearest the accident (zones 1-8)	$\lambda =$	31.904	30df	NS	0.3720
Income	$\lambda =$	14.500	15df	NS	0.4879
*Occupation	$\lambda =$	60.821	30df	$p \leq$	0.0007
Own or rent house	$\lambda =$	5.536	5df	NS	0.3539
*Presence or absence of young children in family	$\lambda =$	46.272	15df	$p \leq$	0.0000
*Younger (20-49yrs) versus older (50-over 80yrs) people	$\lambda =$	20.077	5df	$p \leq$	0.0012
Whether they attempted to return	$\lambda =$	12.310	5df	NS	0.0208

## Question 30(a).

Do you think the evacuation was justified?

(Responses: yes, no)

By:

Residence in evacuation zones nearest the accident (zones 1-8)	$\lambda =$	4.574	6df	NS	0.5994
--	-------------	-------	-----	----	--------

Question 30(a) continued.

Presence or absence of young children in family	$\lambda =$	2.165	3df	NS	0.5388
Younger (20-49yrs) versus Older (50-over 80yrs) people	$\lambda =$	0.543	1df	NS	0.4608
Whether they attempted to return	$\lambda =$	0.992	1df	NS	0.3190

Question 30(b).

Please comment on why you thought the evacuation was (not) justified.

*(Responses: yes - danger, first of kind; yes/no - overreaction,  
insufficient information; no - not enough danger)*

By:

Residence in evacuation zones nearest the accident (zones 1-8)	$\lambda =$	36.297	42df	NS	0.7188
Presence or absence of young children in family	$\lambda =$	13.811	24df	NS	0.9508
Younger (20-49yrs) versus Older (50-over 80yrs) people	$\lambda =$	15.823	8df	NS	0.0450
*Whether they attempted to return	$\lambda =$	20.438	8df	$p \leq$	0.0088

Question 31.

If you were evacuated again, what would you do differently?

*(Responses: take more clothing, go to a hotel, take pets, take  
medication, anticipate long stay, etc.)*

By:

Residence in evacuation zones nearest the accident (zones 1-8)	$\lambda =$	73.180	60df	NS	0.1180
Presence or absence of young children in family	$\lambda =$	27.901	45df	NS	0.9787
Younger (20-49yrs) versus Older (50-over 80yrs) people	$\lambda =$	8.200	15df	NS	0.9155
*Whether they attempted to return	$\lambda =$	12.118	15df	NS	0.6701



Question 23.

Did you apply for compensation from CP rail?

*(Responses: yes, no)*

By:

Residence in evacuation zones nearest to accident (zones 1-8)	$\lambda =$	5.162	6df NS	0.5232
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Presence or absence of young children in family	$\lambda =$	6.375	3df NS	0.0947
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Younger (20-49yrs) versus older (50-over 80yrs) people	$\lambda =$	0.005	1df NS	0.9422
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Whether they attempted to return	$\lambda =$	1.363	1df NS	0.2429
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Question 25.

Do you have any comments about the way CP Rail compensated evacuees?

*(Responses: generally fair, some were compensated, too much haste,  
process was courteous, process was not courteous, complaint regarding  
waiver)*

By:

Residence in evacuation zones nearest to accident (zones 1-8)	$\lambda =$	35.386	42df NS	0.7372
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Presence or absence of young children in family	$\lambda =$	31.119	24df NS	0.1504
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Younger (20-49yrs) versus older (50-over 80yrs) people	$\lambda =$	10.203	8df NS	0.2510
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Whether they attempted to return	$\lambda =$	7.047	8df NS	0.5316
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## Question 17.(a)

For the following events, could you please indicate what you think the chances are of the event happening in Southern Ontario in the next ten years?

*(Responses: very likely, likely, unlikely, very unlikely)*

By:

i) Another derailment as serious as Mississauga

Sex  $\lambda = 1.897$  3df NS 0.5940

Age  $\lambda = 23.751$  21df NS 0.3053

Presence or absence of young children in family  $\lambda = 14.074$  9df NS 0.1197

ii) Road accident involving dangerous release of hazardous chemicals

Sex  $\lambda = 0.780$  3df NS 0.8541

Age  $\lambda = 21.730$  21df NS 0.4152

Presence or absence of young children in family  $\lambda = 18.360$  9df NS 0.0348

iii) Plane crash involving many deaths

Sex  $\lambda = 4.715$  3df NS 0.1939

Age  $\lambda = 22.459$  21df NS 0.3734

Presence or absence of young children in family  $\lambda = 13.274$  9df NS 0.1506

iv) Nuclear reactor accident as serious as 3 Mile Island

Sex  $\lambda = 20.795$  21df NS 0.4715

\*Age  $\lambda = 28.005$  3df  $p \leq 0.0000$

Presence or absence of young children in family  $\lambda = 3.173$  9df NS 0.9570

SURVEY OF EVACUATION CENTRE USERS, JULY 1980 (see Appendix 3 for questionnaire used).

Question 40.

Which evacuation centre did you stay in?

(Responses: International Centre, Morningstar SS, Brampton SS, Sherway Gardens, Square One, Erindale SS, Streetsville SS, Vic Johnson Arena)

By:

Occupation	$\lambda = 38.488$ 42df NS 0.6259
Age	$\lambda = 37.568$ 42df NS 0.6657
Income	$\lambda = 16.947$ 14df NS 0.2590
Sex	$\lambda = 10.377$ 7df NS 0.1682
*Residential zone	$\lambda = 184.717$ 91df $p \leq 0.0000$
Own or rent house	$\lambda = 14.921$ 7df NS 0.0370

Question 7.

How many days did you stay in the evacuation centre?

(Responses: 1 day to 7 days)

By:

Occupation	$\lambda = 28.005$ 30df NS 0.5701
Age	$\lambda = 24.206$ 25df NS 0.5075
Income	$\lambda = 16.723$ 10df NS 0.0807
Sex	$\lambda = 3.766$ 5df NS 0.5834
Residential zone	$\lambda = 73.356$ 60df NS 0.1153
Own or rent house	$\lambda = 2.582$ 5df NS 0.7640

Question 43.

In your opinion, how well was the evacuation centre run?

(Responses: very well, adequately, poorly)

By:

Evacuation centre visited	$\lambda = 12.018$ 14df NS 0.6048
People that stayed more than one night in evacuation centres	$\lambda = 8.817$ 10df NS 0.5495
Age	$\lambda = 4.334$ 12df NS 0.9766

Question 42.

How did you feel about the following facilities in the evacuation centre?

(Responses: *Excellent, adequate, inadequate*)

a) Food quality

By:

Evacuation centre visited  $\lambda = 22.238$  14df NS 0.0738

People that stayed more than  
one night in evacuation centres  $\lambda = 6.859$  10df NS 0.7387

Age  $\lambda = 16.379$  12df NS 0.1745

b) Sleeping

By:

Evacuation centre visited  $\lambda = 12.555$  14df NS 0.5618

People that stayed more than  
one night in evacuation centres  $\lambda = 13.023$  10df NS 0.2224

\*Age  $\lambda = 26.623$  12df  $p \leq 0.0088$

c) Washrooms

By:

Evacuation centre visited  $\lambda = 10.809$  14df NS 0.7009

People that stayed more than  
one night in evacuation centres  $\lambda = 13.096$  10df NS 0.2183

Age  $\lambda = 21.510$  12df NS 0.0434

d) Recreation

By:

Evacuation centre visited  $\lambda = 23.109$  14df NS 0.0585

People that stayed more than  
one night in evacuation centres  $\lambda = 9.879$  10df NS 0.4512

Age  $\lambda = 21.106$  12df NS 0.0488

e) Health Care

By:

Evacuation centre visited  $\lambda = 21.889$  14df NS 0.0809

People that stayed more than  
one night in evacuation centres  $\lambda = 8.547$  10df NS 0.5722

Age  $\lambda = 10.681$  12df NS 0.5564

Question 43 continued.f) Information

By:

Evacuation centre visited  $\lambda = 16.870$  14df NS 0.2631People that stayed more than  
one night in evacuation centres  $\lambda = 5.810$  10df NS 0.8310Age  $\lambda = 12.495$  12df NS 0.4068

## Question 9.

Did you have ENOUGH information about:*(Responses: yes, no)*a) your pets left behind?

By:

Evacuation centre visited  $\lambda = 5.408$  7df NS 0.6102People that stayed more than  
one night in evacuation centres  $\lambda = 8.088$  5df NS 0.1514b) the security of your property?

By:

Evacuation centre visited  $\lambda = 10.308$  7df NS 0.1718People that stayed more than  
one night in evacuation centres  $\lambda = 4.220$  5df NS 0.5181

## Question 13.

Even though the length of the evacuation could not be predicted do you  
think the evacuees should have been warned that the evacuation might  
last for several days?*(Responses: yes, no)*

By:

Evacuation centre visited  $\lambda = 8.352$  7df NS 0.3025People that stayed more than  
one night in evacuation centres  $\lambda = 2.459$  5df NS 0.7826

Question 12.

Did you feel that you were getting the real story during the emergency?  
(Responses: yes, no, not sure)

By:

Evacuation centre visited  $\lambda = 7.242$  14df NS 0.9250

People that stayed more than  
one night in evacuation centres  $\lambda = 7.700$  10df NS 0.6573

Question 31.

If you were evacuated again, what would you do differently?  
(Responses: take more clothing, go to a hotel, take pets, take medication,  
anticipate a longer stay, etc.)

By:

\*Evacuation centre visited  $\lambda = 213.954$  119df  $p \leq 0.0000$

People that stayed more than  
one night in evacuation centres  $\lambda = 76.610$  65df NS 0.1536

TELEPHONE SURVEY OF HOUSEHOLDS OUTSIDE THE EVACUATION ZONE (see Appendix 4  
for questionnaire used).

Question 7.(a)

Would you say you were concerned about this (hazardous goods transport)  
BEFORE the accident?  
(Responses: very concerned, concerned, not concerned)

By:

Residential perimeter zone  $\lambda = 2.066$  4df NS 0.7235

Residence in perimeter zone close  
to accident versus zones far from  
accident  $\lambda = 0.657$  2df NS 0.7200

Presence or absence of young  
children in family  $\lambda = 13.723$  8df NS 0.0893

Age  $\lambda = 2.322$  2df NS 0.3131

Own or rent house  $\lambda = 1.601$  2df NS 0.4489

Why they decided to evacuate  $\lambda = 0.450$  4df NS 0.9782

## Question 8.

How concerned are you TODAY about it?*(Responses: very concerned, concerned, not concerned)*

By:

Residential perimeter zone	$\lambda =$	4.020	4df	NS	0.4033
Residence in perimeter zone close to accident versus zones far from accident	$\lambda =$	1.795	2df	NS	0.4075
Presence or absence of young children in family	$\lambda =$	10.099	10df	NS	0.3498
Age	$\lambda =$	1.022	2df	NS	0.5999
Own or rent house	$\lambda =$	0.110	2df	NS	0.9464
Why they decided to evacuate	$\lambda =$	5.284	4df	NS	0.2593

## Question 9.

Did you feel that you were getting the real story during the emergency?*(Responses: yes, no, not sure)*

By:

*Residential perimeter zone	$\lambda =$	16.199	6df	$p \leq$	0.0127
Residence in perimeter zone close to accident versus zones far from accident	$\lambda =$	5.733	3df	NS	0.1253
Presence or absence of young children in family	$\lambda =$	9.811	15df	NS	0.8312
Age	$\lambda =$	6.948	3df	NS	0.0736
Own or rent house	$\lambda =$	1.680	3df	NS	0.6414
Why they decided to evacuate	$\lambda =$	11.832	6df	NS	0.0658

## Question 5.

Why did you decide (not) to evacuate?*(Responses: not asked, not enough risk, not in evacuation zone, in case of danger, saw others go, advised to go, frightened, etc.)*

By:

Presence or absence of young children in family	$\lambda =$	6.644	10df	NS	0.7540
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Question 5 continued.

Age	$\lambda =$	9.532	10df	NS	0.4824
Sex	$\lambda =$	0.670	2df	NS	0.7450
Residential perimeter zone	$\lambda =$	5.792	4df	NS	0.2152
Own or rent house	$\lambda =$	3.865	2df	NS	0.1448

Appendix 8

EMERGENCY OPERATIONS CONTROL GROUP

Appendix 8

The composition of the Emergency Operations Control Group (EOCG) altered substantially over the course of the week of the derailment emergency. It began originally as a "think tank" made up of senior police officers from Peel Region, and, indeed, may strictly be said to have remained a "think tank" although it became substantially enlarged and more often referred to as the EOCG. The term EOCG, as outlined in Chapters 2 and 3, comes from the Mississauga municipal and Peel Region regional emergency plans, which were not officially invoked.

As the emergency progressed, the police officers were first augmented by the Fire Chief, Gordon Bentley, the Mayor of Mississauga, Hazel McCallion, and Peel Regional Chairman Frank Bean. The Control Group was further enlarged with substantial provincial involvement late on Sunday morning (November 11) of members of the O.P.P., the Ministry of the Solicitor General, the Ministry of Health and the Ministry of the Environment. Through Sunday, more and more representatives from government and industry became part of the Control Group, until such time as it became too large and unwieldy. At this point, on Monday (November 12), a smaller Control Group was organised. For the rest of the week, relevant personnel were invited to the Control Group meetings to advise or to make presentations. Beginning on Wednesday (November 14), a transcript of the proceedings was made, with the names of members and attendees appended. What follows is a consolidation of that appended list:

Mr. David Allen, Communications Director, Office of the Attorney General  
Mr. Russell S. Allison, Vice-President, Canadian Pacific Railway  
Mr. William Appleton, Chairman, Board of Commissioners of Police,  
Peel Region  
Mr. Frank Bean, Chairman, Region of Peel  
Chief Gordon Bentley, Mississauga Fire Department  
Detective Boyd Brown, Peel Regional Police Force  
Chief Douglas K. Burrows, Chief of Peel Regional Police Force  
Dr. Lillian Cherkas, Department of Public Health, Region of Peel  
Deputy Commissioner Jim Erskine, Ontario Provincial Police Force  
Mr. Robert Frewin, Director of Information Branch, Ministry of the Environment

Dr. Max Fitch, Ministry of Labour, Occupational Health Branch

Mr. Don Hamilton, Dow Chemical (Chlorex)

Mr. Fred Hamlin, Production Manager, Chlor-alkali, Dow Chemical, Chlorex

Chief Cyril Hare, Fire Prevention Officer, Mississauga Fire Department

Mr. A. Hill, General Manager of Eastern Region, Canadian Pacific  
Railway (then)

Mr. John Hilton, Deputy Solicitor General

Mr. Otto Jelinek, M.P., Assistant to the Federal Minister of Ontario

Mr. David Johnson, Operations Manager, Superior Propane

Mr. Terry Jones, M.P.P., Mississauga North

Mr. Walter Karskavich, Canadian Transport Commission

Mr. Douglas R. Kennedy, M.P.P., Mississauga South

Staff Inspector Barry V. King, Peel Regional Police Force

Dr. Robert J. MacBride, Principal Program Advisor, Emergency Health Services

Staff Inspector Ewen MacDonald, Peel Regional Police Force

Mayor Hazel McCallion, City of Mississauga

Mr. John McGee, Assistant to the Minister, Canadian Transport Commission

The Honourable Roy McMurtry, Solicitor General for Ontario

The Honourable Harry Parrott, Minister of the Environment (then)

Miss S. Reid, Secretary, Peel Regional Police Force (then)

Mr. Graham Scott, Deputy Minister of the Environment

Mr. L. Shenfeld, Supervisor of Air Quality, Ministry of the Environment

Mr. Kenneth Sider, Superintendent, Peel Regional Police Force

Mr. Basil Singh, Manager of Technical Support Section, Ministry of  
the Environment

Deputy Chief W. Teggart, Peel Regional Police Force

Dr. Gregg Van Volkenburgh, Director of Air Resource Branch, Ministry  
of the Environment

Deputy Chief Art Warner, Mississauga Fire Department (then)



